IQ 100 Series (130/140/150)

Meter User & Installation Manual

Powering Business Worldwide

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Rev D

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e-mail: TRC@eaton.com

IQ 100 Series Meter Overview and Specifications

Hardware Overview

The IQ 100 (IQ 130/140/150) is a multifunction power meter designed to be used in electrical substations, panel boards and as a power meter for OEM equipment. The unit provides multifunction measurement of most electrical parameters.

The unit is designed with advanced meaurement capabilities, allowing it to achieve high performance accuracy. The IQ 100 meter is specified as a 0.5% class energy meter for billing applications as well as a highly accurate panel indication meter.

The IQ 100 meter provides a host of additional capabilities, including optional RS485 Modbus.

IQ 100 meter features that are detailed in this manual are as follows:
- 0.5% Class Revenue Certifiable Energy and Demand (IQ 140/150) Metering
- Meets ANSI C12.20 (0.5%)
- Multifunction Measurement including Voltage, Current, Power, Frequency, Energy, etc.
- Field Upgrade without Removing Installed Meter
- Percentage of Load Bar for Analog Meter Perception
- Easy to Use Faceplate Programming

The IQ 100 Series meter is available in two configurations: meter/transducer and transducer only.

IQ 100 Series Meter / Digital Transducer
Meter and transducer in one compact unit. Features an optional RS485 and KYZ Pulse Output, and can be programmed using the faceplate of the meter. ANSI or DIN mounting may be used.

IQ 100 Series Digital Transducer
A Digital Transducer only unit providing RS485 communication via Modbus RTU or Modbus ASCII protocols. The unit is designed to install using DIN Rail Mounting (see instructions on page 20).

Voltage and Current Inputs

Universal Voltage Inputs
Voltage Inputs allow measurement to 416 Volts Line-to-Neutral and 721 Volts Line-to-Line. This insures proper meter safety when wiring directly to high voltage systems. One unit will perform to specification on 69 Volt, 120 Volt, 230 Volt, 277 Volt, 277 Volt and 347 Volt power systems.

Current Inputs

The IQ 100 Series meter's Current Inputs use a unique dual input method:

- Method 1: CT Pass Through
  The CT passes directly through the meter without any physical termination on the meter. This insures that the meter cannot be a point of failure on the CT circuit. This is preferable for utility users when sharing relay class CTs. No Burden is added to the secondary CT circuit.

- Method 2: Current "Gills".
  This unit additionally provides ultra-rugged Termination Pass Through Bars that allow CT leads to be terminated on the meter. This, too, eliminates any possible point of failure at the meter. This is a preferred technique for insuring that relay class CT integrity is not compromised (the CT will not open in a fault condition).

Ordering Information

IQ - 150 - M - A - 6 - 5 - 1 - 1
1 2 3 4 5 6

1. Model:
   130 = Volts/Amps Meter
   140 = Power Meter
   150 = Energy Meter
2. Meter Type
   M = Meter (with integral display)
   T = Transducer Only (no display, RS485 Modbus and KYZ Pulse Output are standard with type T)
3. Frequency:
   5 = 50 Hz System
   6 = 60 Hz System
4. Current Input:
   5 = 5 Amp Secondary
   1 = 1 Amp Secondary
5. Power Supply:
   1 = Universal, (90 - 265) VAC @50/60Hz or (100-370) VDC
   4 = (18 - 60) VDC
6. Communication
   0 = None
   1 = RS485 Modbus and KYZ Pulse Output

Example: IQ 150-M-A-6-5-1-1

(IQ 150 Energy Meter with 60 Hz System, 5 Amp Secondary, 90-265 VAC/100-370 VDC Power Supply, RS485 Modbus and KYZ Pulse Output)

Measured Values

The following table lists the measured values available for the different IQ 100 Series models.

IQ 100 Series Feature Comparison			
Readings/Features	IQ 130	IQ 140	IQ150
Volts L-N	Yes	Yes	Yes
Volts L-N Max/Min	Yes	Yes	Yes
Volts L-L	Yes	Yes	Yes
Volts L-L Max/Min	Yes	Yes	Yes
Amps	Yes	Yes	Yes
Amps Neutral	Yes	Yes	Yes
Amps Max/Min	Yes	Yes	Yes
kW, +/-/, Max/Min	No	Yes	Yes
kVAR, +/-/, Max/Min	No	Yes	Yes
PF, +/-/, Max/Min	No	Yes	Yes
kVA, Max,/Min	No	Yes	Yes
Frequency	No	Yes	Yes
kWh	No	No	Yes
kVARh	No	No	Yes
kVAh	No	No	Yes
Energy Accumulators	No	No	Yes
Demand Values	No	Yes	Yes

Utility Peak Demand (IQ140/150)

The IQ 100 Series meter provides user-configured Fixed Window or Sliding Window Demand. This feature allows you to set up a Customized Demand Profile. Fixed Window Demand is demand used over a user-configured demand period (usually 5, 15 or 30 minutes). Sliding Window Demand is a fixed window demand that moves for a user-specified subinterval period. An example of Sliding Window Demand is a 15-minute demand using 3 subintervals and providing a new demand reading every 5 minutes, based on the last 15 minutes.

Utility Demand Features can be used to calculate kW, kVAR, kVA and PF readings. All other parameters offer Max and Min capability over the user-selectable averaging period. Voltage provides an Instantaneous Max and Min reading which displays the highest surge and lowest sag seen by the meter.

Specifications

Power Supply

·	Range:	1 Option: Universal, (90 to 265) VAC @50/60Hz or (100 to 370) VDC 4 Option: (18-60) VDC
·	Power Consumption:	5 VA, 3.5W

Voltage Inputs (Measurement Category III)

·	Range:	Universal, Auto-ranging up to 416Vac L-N, 721Vac L-L
·	Supported hookups:	3 Element Wye, 2.5 Element Wye, 2 Element Delta, 4 Wire Delta
·	Input Impedance:	1M Ohm/Phase
·	Burden:	0.0144VA/Phase at 120 Volts
·	Pickup Voltage:	10Vac
·	Connection:	Screw terminal (Figure 3.4)
·	Max Input Wire Gauge:	AWG#12 / 2.5mm2
·	Fault Withstand:	Meets IEEE C37.90.1
·	Reading:	Programmable Full Scale to any PT Ratio

Current Inputs

·	Class 10:	5A Nominal, 10A Maximum
·	Class 2:	1A Nominal, 2A Maximum
·	Burden:	0.005VA Per Phase Max at 11 Amps
·	Pickup Current:	0.1% of Nominal
·	Connections:	O or U Lug Electrical Connection (Figure 3.1) Pass-through Wire, 0.177" / 4.5mm Maximum Diameter (Figure 3.2) Quick Connect, 0.25" Male Tab (Figure 3.3)
·	Fault Withstand:	100A/10sec., 300A/3sec ., 500A/1sec.
·	Reading:	Programmable Full Scale to any CT Ratio

Isolation

- All Inputs and Outputs are galvanically isolated to 2500 Vac

Environmental Rating

- Storage: (-40 to +85)° C
- Operating: (-20 to +70)° C
- Humidity: to 95% RH Non-condensing
- Faceplate Rating: NEMA12 (Water Resistant), Mounting Gasket Included

Measurement Methods

- Voltage, Current: True RMS
- Power: Sampling at 400+ Samples per Cycle on All Channels Measured Readings Simultaneously
- A/D Conversion: 6 Simultaneous 24 bit Analog to Digital Converters

Update Rate

- Watts, VAR and VA: 100 milliseconds (Ten times per second)
- All other parameters: 1 second

Communication Format

1. Optional RS485 and KYZ Pulse Output through Back Plate (Standard with Transducer-only version)

- Protocols: Modbus RTU, Modbus ASCII
- Com Port Baud Rate: 9600 to 57,600 b/s
- Com Port Address: 001-247
- Data Format: 8 Bit, No Parity
- IQ 100 Series Transducer Default Initial Communication Baud 9600 (see Chapter 4)

Mechanical Parameters

- Dimensions: (H4.85 x W4.82 x L4.25) inches, (H123.2 x W123.2 x L105.4) mm
  Mounts in 92mm square DIN or ANSI C39.1, 4" Round Cut-out
- Weight: 2 pounds, 0.907kg (ships in a 6"/152.4mm cube container)

Compliance

- UL Listing: USL/CNL E185559
- IEC 687 (0.5% Accuracy)
- ANSI C12.20 (0.5% Accuracy)
- ANSI (IEEE) C37.90.1 Surge Withstand
- ANSI C62.41 (Burst)
- IEC1000-4-2: ESD
- IEC1000-4-3: Radiated Immunity
- IEC1000-4-4: Fast Transient
- IEC1000-4-5: Surge Immunity

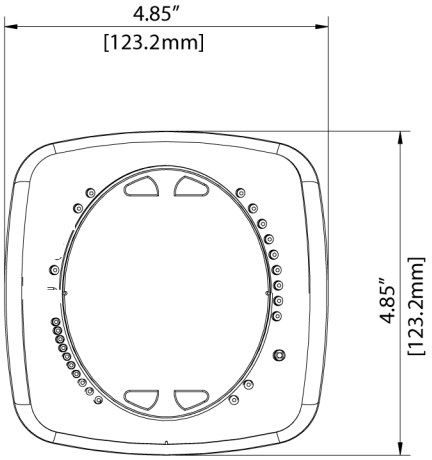
Accuracy

Meter Accuracy by Measured Parameter		
Measured Parameters	Accuracy % of Reading*	Display Range
Voltage L-N	0.25%	0-9999 V or kV Autoscale
Voltage L-L	0.25%	0-9999 V or kV Autoscale
Current Phase	0.25%	0-9999 V or kV Autoscale
Current Neutral (Calculated)	2.0% F.S.	0-9999 V or kV Autoscale
+/- Watts	0.5%	0-9999 Watts, kWatts, MWatts
+/- Wh	0.5%	5 to 8 Digits Programmable
+/- VARs	0.5%	0-9999 VARs, kVARs, MVARs
+/- VARh	0.5%	5 to 8 Digits Programmable
VA	0.5%	0-9999 VA, kVA, MVA
VAh	0.5%	5 to 8 Digits Programmable
PF	0.5%	+/- 0.5 to 1.0
Frequency	+/- 0.01 Hz	45 to 65 Hz
% of Load Bar	1-120%	10 Segment Resolution Scalable
*Accuracy stated for 5Amp secondary WYE or Delta connections. For 1Amp secondary or 2.5 element connections, add 0.1% of Full Scale + 1 digit to accuracy specification.		

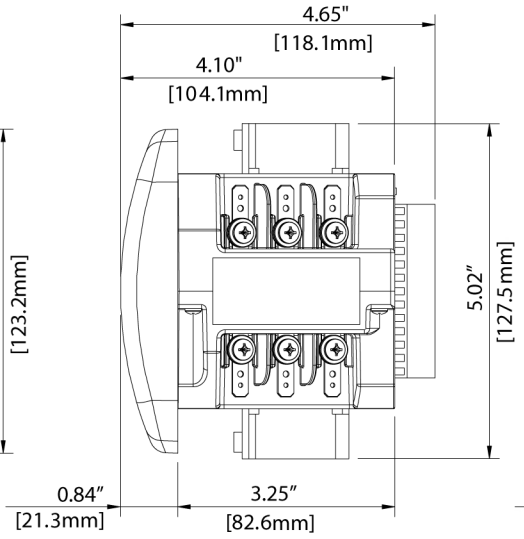
IQ 100 Series Mechanical Installation

Introduction

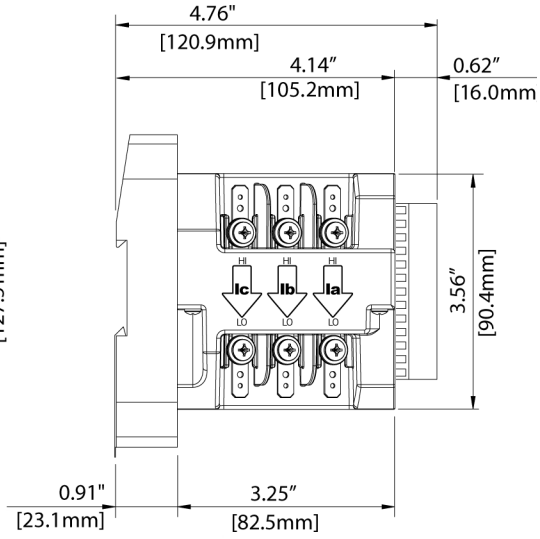
IQ 100 Series meter can be installed using a standard ANSI C39.1 (4" Round) or an IEC 92mm DIN (Square) form. In new installations, simply use existing DIN or ANSI punches. For existing panels, pull out old analog meters and replace with the IQ 100 Series meter. The various models use the same installation. See the next chapter for wiring diagrams.



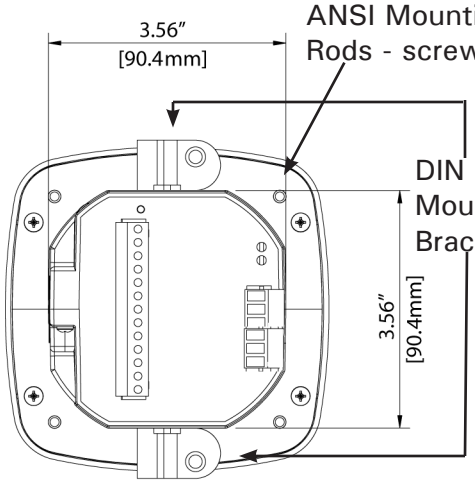
Meter Face



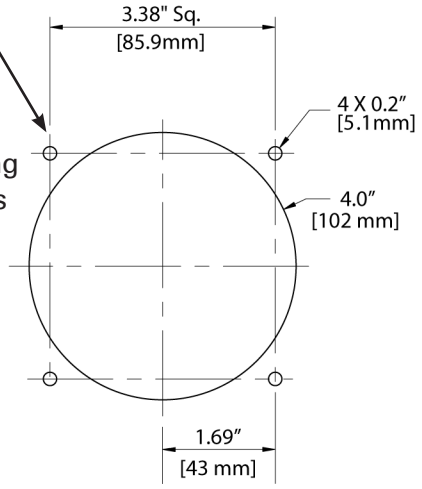
Meter Dimensions



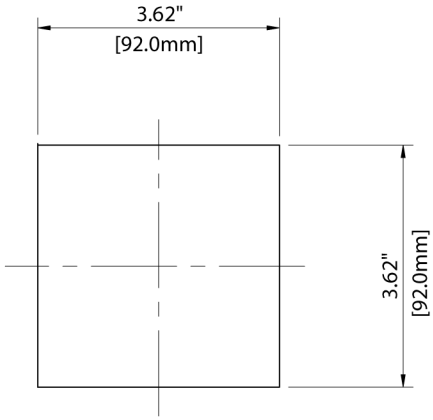
Transducer Dimensions



Meter Back



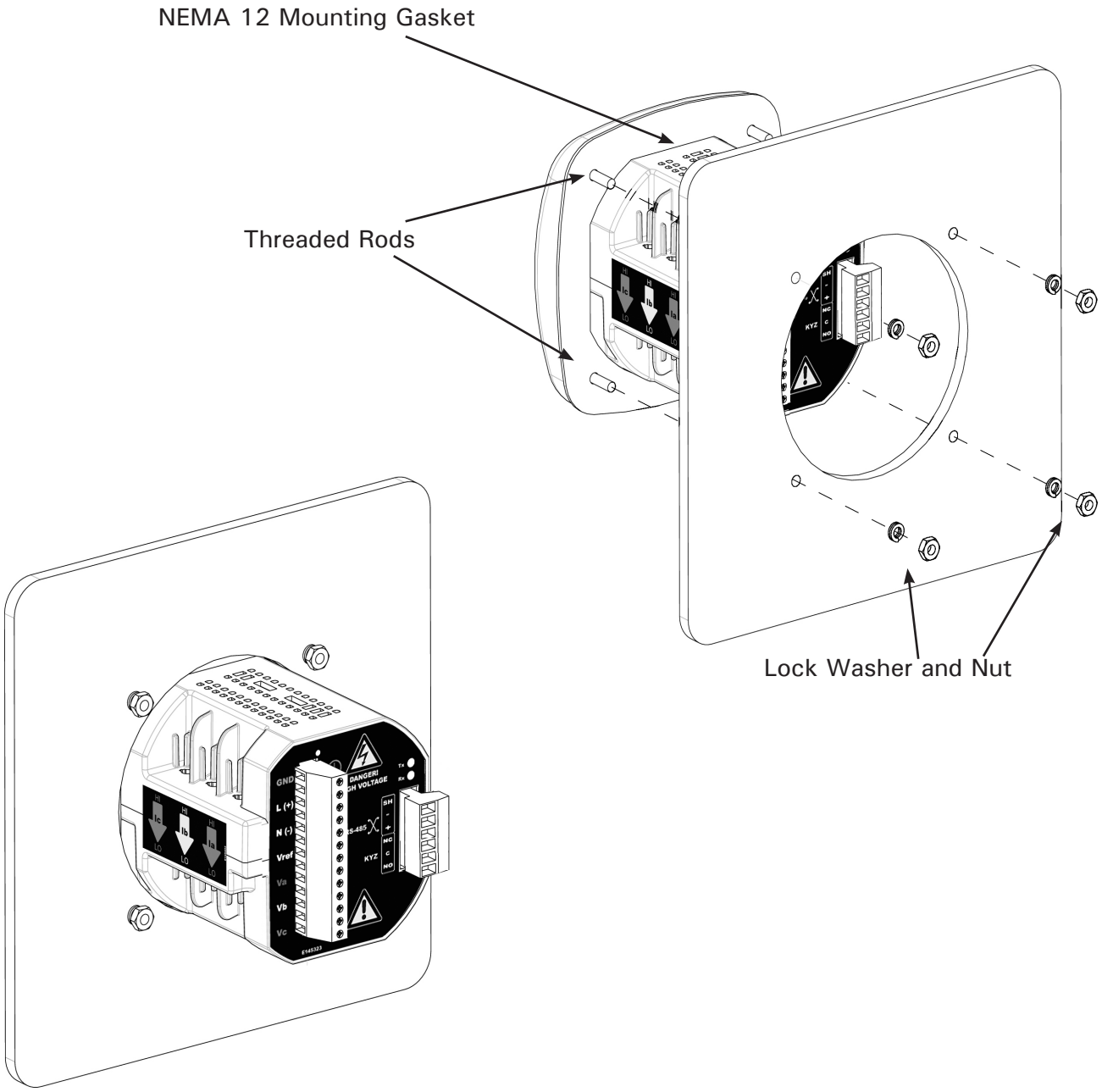
ANSI Mounting Panel Cut-out



DIN Mounting Cut-out

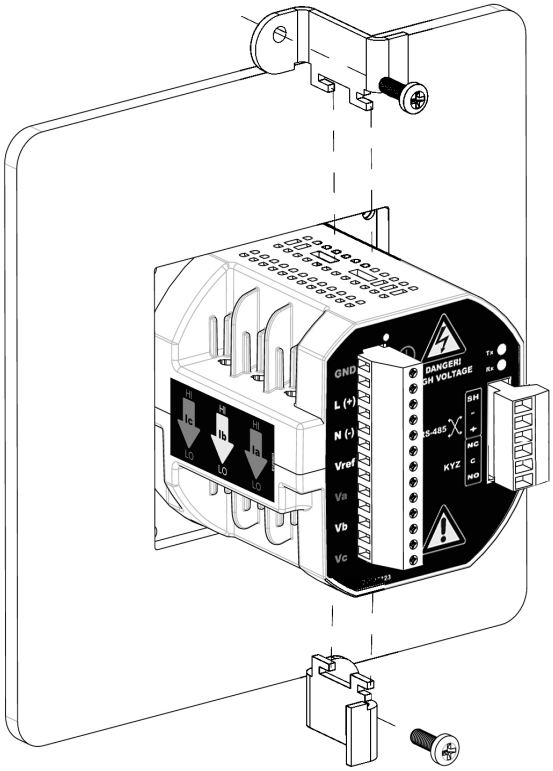
- Recommended Tools for IQ 100 Series meter Installation: #2 Phillips screwdriver, Small wrench and Wire cutters. Transducer Installation doesn't require any tools.
- Mount the meter in a dry location, which is free from dirt and corrosive substances. The meter is designed to withstand harsh environmental conditions (see Specifications earlier in the manual).

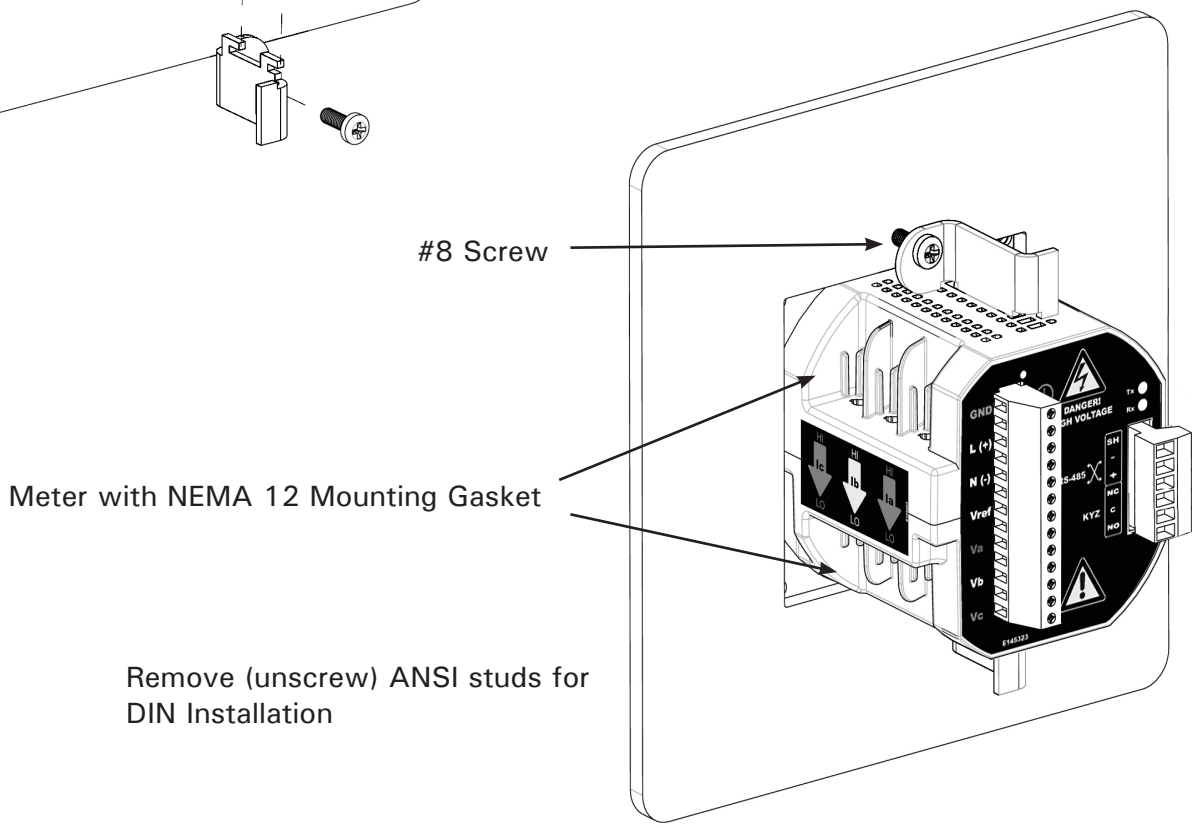
ANSI Installation Steps



1. Insert 4 threaded rods by hand into the back of meter. Twist until secure.
2. Slide ANSI 12 Mounting Gasket onto back of meter with rods in place.
3. Slide meter with Mounting Gasket into panel.
4. Secure from back of panel with lock washer and nut on each threaded rod. Use a small wrench to tighten. Do not overtighten. **The maximum installation torque is 0.4 Newton-Meter.**

DIN Installation Steps



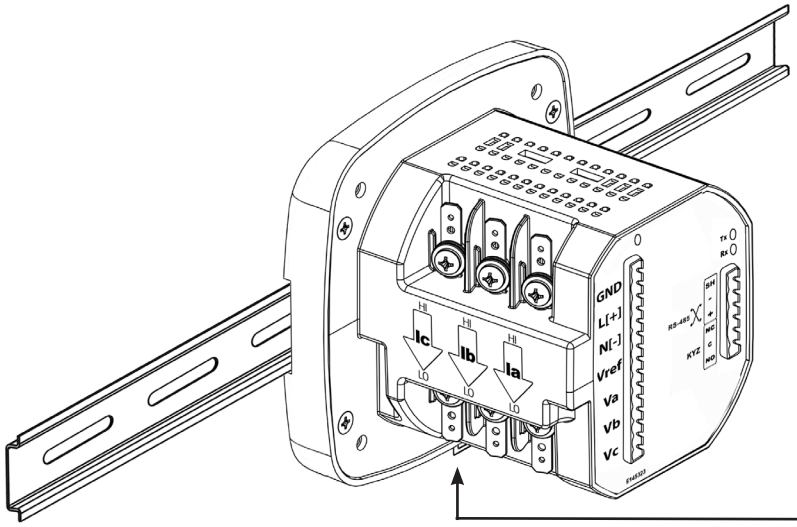


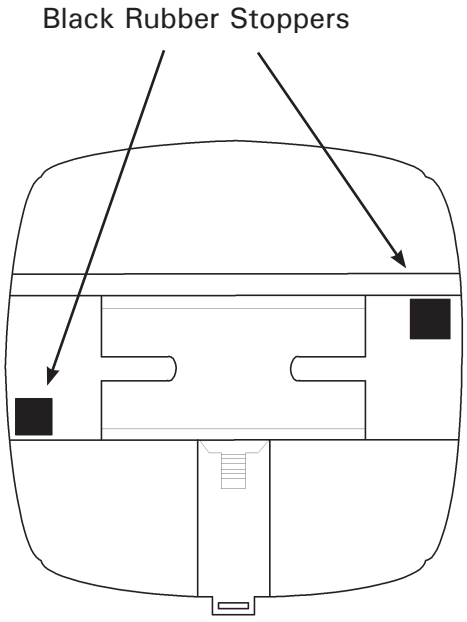
1. Slide meter with NEMA 12 Mounting Gasket into panel. (Remove ANSI Studs, if in place.)
2. From back of panel, slide 2 DIN Mounting Brackets into grooves in top and bottom of meter housing. Snap into place.
3. Secure meter to panel with lock washer and a #8 screw through each of the 2 mounting brackets. Tighten with a #2 Phillips screwdriver. Do not overtighten.

IQ 100 Series Transducer Installation

The IQ 100 Series Transducer model is installed using DIN Rail Mounting.

Specs for DIN Rail Mounting: International Standards DIN 46277/3
DIN Rail (Slotted) Dimensions: 0.297244″ x 1.377953″ x 3″ (inches)
7.55mm x 35mm x 76.2mm (millimeters)





DIN Rail Detail

DIN RAIL INSTALLATION STEPS:

1. Slide top groove of meter onto the DIN Rail.
2. Press gently until the meter clicks into place.

NOTE: If mounting with the DIN Rail provided, use the Black Rubber Stoppers (also provided).

TO REMOVE METER FROM DIN RAIL:

Pull down on Release Clip to detach the unit from the DIN Rail.

NOTE ON DIN RAILS:

DIN Rails are comonly used as a mounting channel for most terminal blocks, control devices, circuit protection devices and PLCs. DIN Rails are made of cold rolled steel electrolitically plated and are also available in aluminum, PVC, stainless steel and copper.

IQ 100 Series Electrical Installation

Considerations When Installing Meters

- Installation of the IQ 100 Series meter must be performed by only qualified personnel who follow standard safety precautions during all procedures. Those personnel should have appropriate training and experience with high voltage devices. Appropriate safety gloves, safety glasses and protective clothing is recommended.

- During normal operation of the IQ 100 Series meter, dangerous voltages flow through many parts of the meter, including: Terminals and any connected CTs (Current Transformers) and PTs (Potential Transformers), all I/O Modules (Inputs and Outputs) and their circuits. All Primary and Secondary circuits can, at times, produce lethal voltages and currents. Avoid contact with any current-carrying surfaces.

- Do not use the meter for primary protection or in an energy-limiting capacity. The meter can only be used as secondary protection. Do not use the meter for applications where failure of the meter may cause harm or death. Do not use the meter for any application where there may be a risk of fire.

- All meter terminals should be inaccessible after installation.

- Do not apply more than the maximum voltage the meter or any attached device can withstand. Refer to meter and/or device labels and to the Specifications for all devices before applying voltages. Do not HIPOT/Dielectric test any Outputs, Inputs or Communications terminals.

- Eaton recommends the use of Shorting Blocks and Fuses for voltage leads and power supply to prevent hazardous voltage conditions or damage to CTs, if the meter needs to be removed from service. CT grounding is optional.

NOTE: IF THE EQUIPMENT IS USED IN A MANNER NOT SPECIFIED BY THE MANUFACTURER, THE PROTECTION PROVIDED BY THE EQUIPMENT MAY BE IMPAIRED.

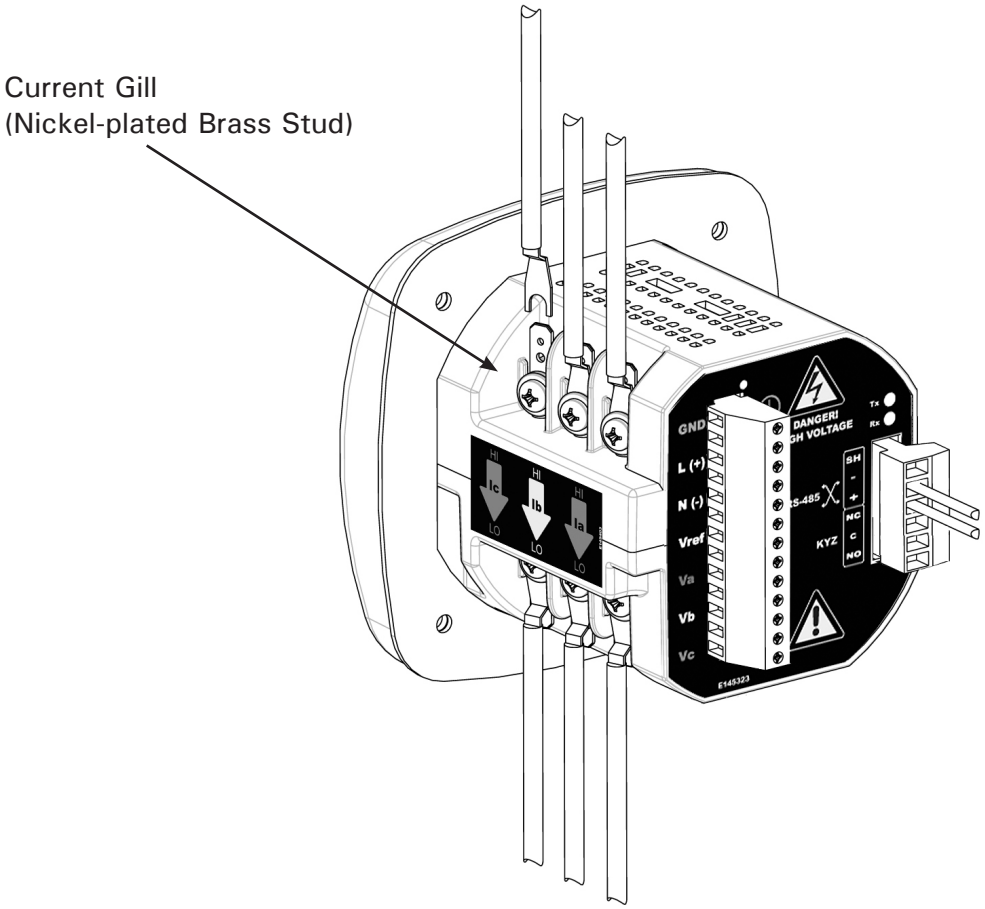
NOTE: THERE IS NO REQUIRED PREVENTIVE MAINTENANCE OR INSPECTION NECESSARY FOR SAFETY. HOWEVER, ANY REPAIR OR MAINTENANCE SHOULD BE PERFORMED BY THE FACTORY.

DISCONNECT DEVICE: The following part is considered the equipment disconnect device. A SWITCH OR CIRCUIT-BREAKER SHALL BE INCLUDED IN THE END-USE EQUIPMENT OR BUILDING INSTALLATION. THE SWITCH SHALL BE IN CLOSE PROXIMITY TO THE EQUIPMENT AND WITHIN EASY REACH OF THE OPERATOR. THE SWITCH SHALL BE MARKED AS THE DISCONNECTING DEVICE FOR THE EQUIPMENT.

CT Leads Terminated to Meter

The IQ 100 Series meter is designed to have Current Inputs wired in one of three ways. The diagram below shows the most typical connection where CT Leads are terminated to the meter at the Current Gills. This connection uses Nickel-Plated Brass Studs (Current Gills) with screws at each end. This connection allows the CT wires to be terminated using either an "O" or a "U" lug. Tighten the screws with a #2 Phillips screwdriver. The maximum installation torque is 1 Newton-Meter.

Other current connections are shown in Figures on the next two pages. A Voltage and RS485 Connection is shown on page 25.

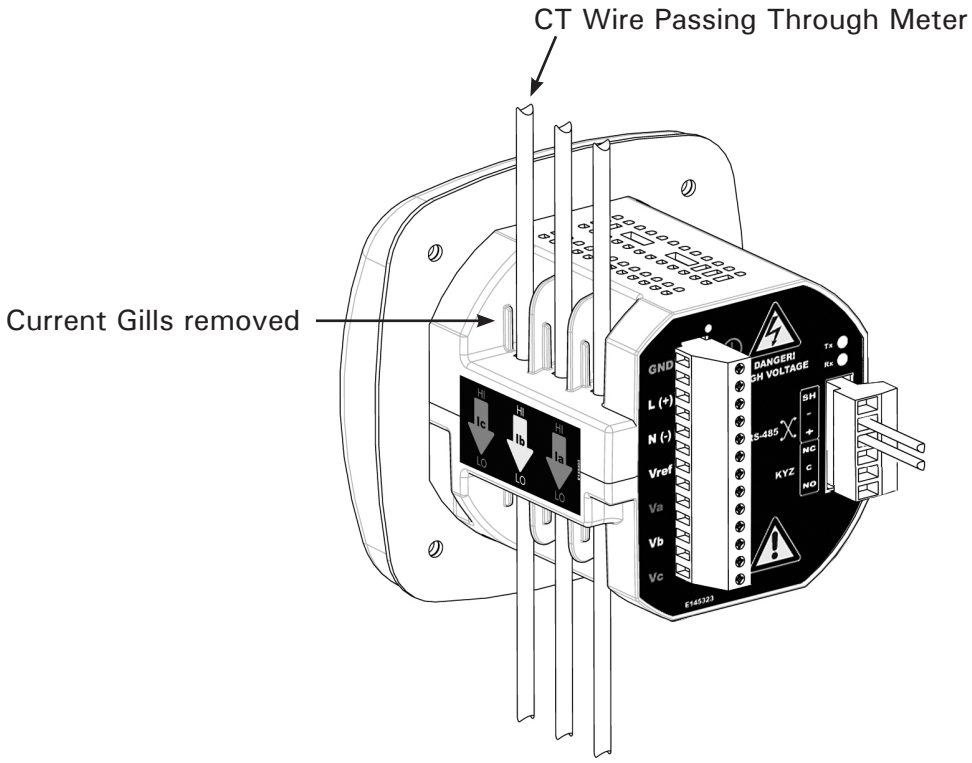


CT Leads Terminated to Meter, #8 Screw for Lug Connection

Wiring Diagrams are shown beginning on page 26.
Communications Connections are detailed in the next chapter.

CT Leads Pass-Through (No Meter Termination)

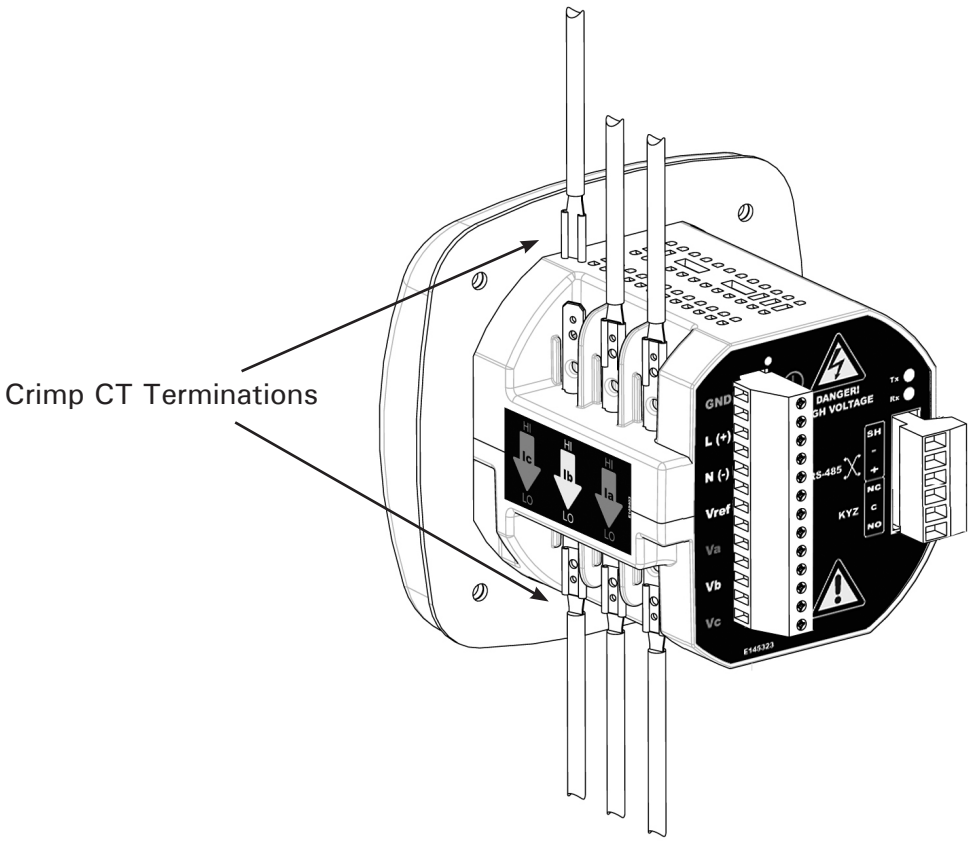
The second method allows the CT wires to pass through the CT Inputs without terminating at the meter. In this case, remove the Current Gills and place the CT wire directly through the CT opening. The opening will accomodate up to 0.177" / 4.5mm maximum diameter CT wire.



Pass-through Wire Electrical Connection

Quick Connect Crimp CT Terminations

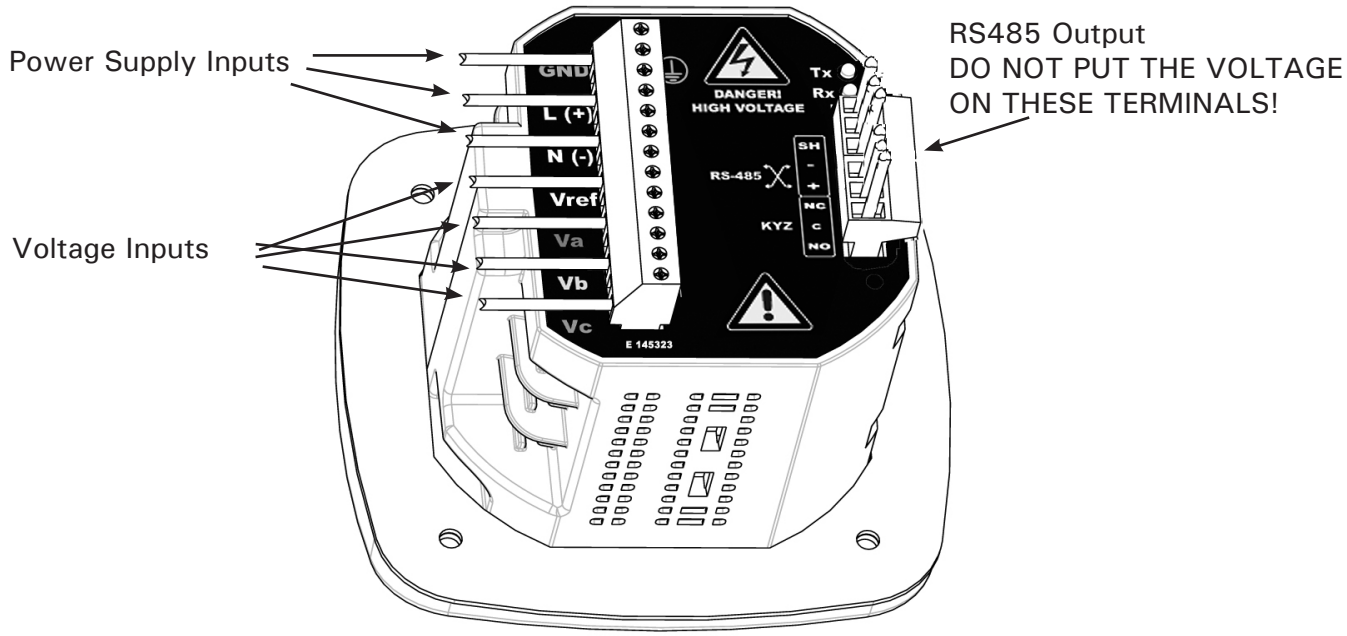
For Quick Termination or for Portable Applications, a Quick Connect Crimp CT Connection can also be used.



Quick Connect Electrical Connection

Voltage and Power Supply Connections

Voltage Inputs are connected to the back of the unit via a optional wire connectors. The connectors accomodate up to AWG#12 / 2.5mm wire.



Voltage Connection

Ground Connections

The meter's Ground Terminals ( ) should be connected directly to the installation's protective earth ground. Use 2.5mm wire for this connection.

Voltage Fuses

Eaton recommends the use of fuses on each of the sense voltages and on the control power, even though the wiring diagrams in this chapter do not show them.

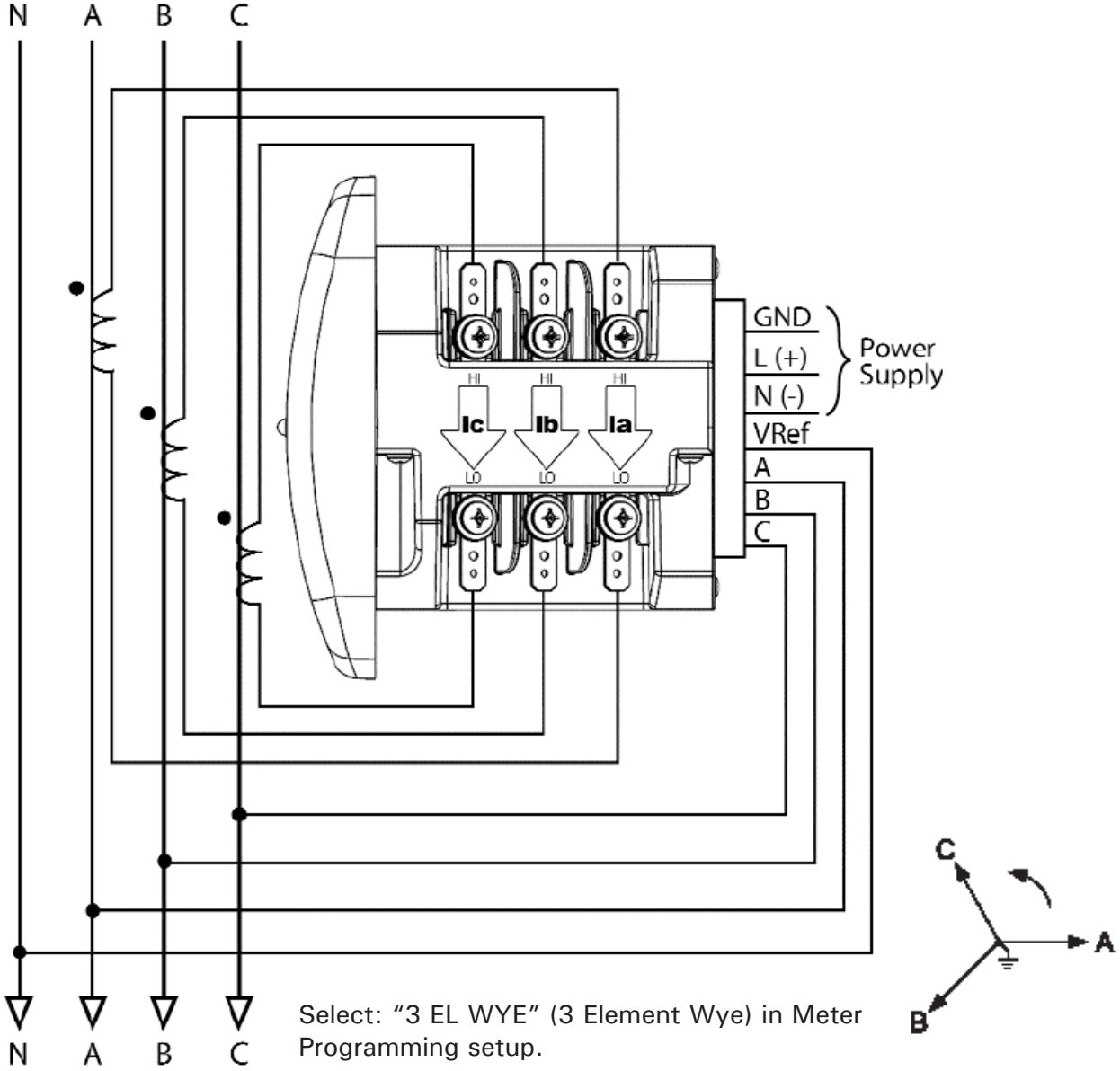
- Use a 0.1 Amp fuse on each voltage input.
- Use a 3 Amp fuse on the power supply.

Electrical Connection Diagrams

Choose the diagram that best suits your application. Be sure to maintain the CT polarity when wiring.

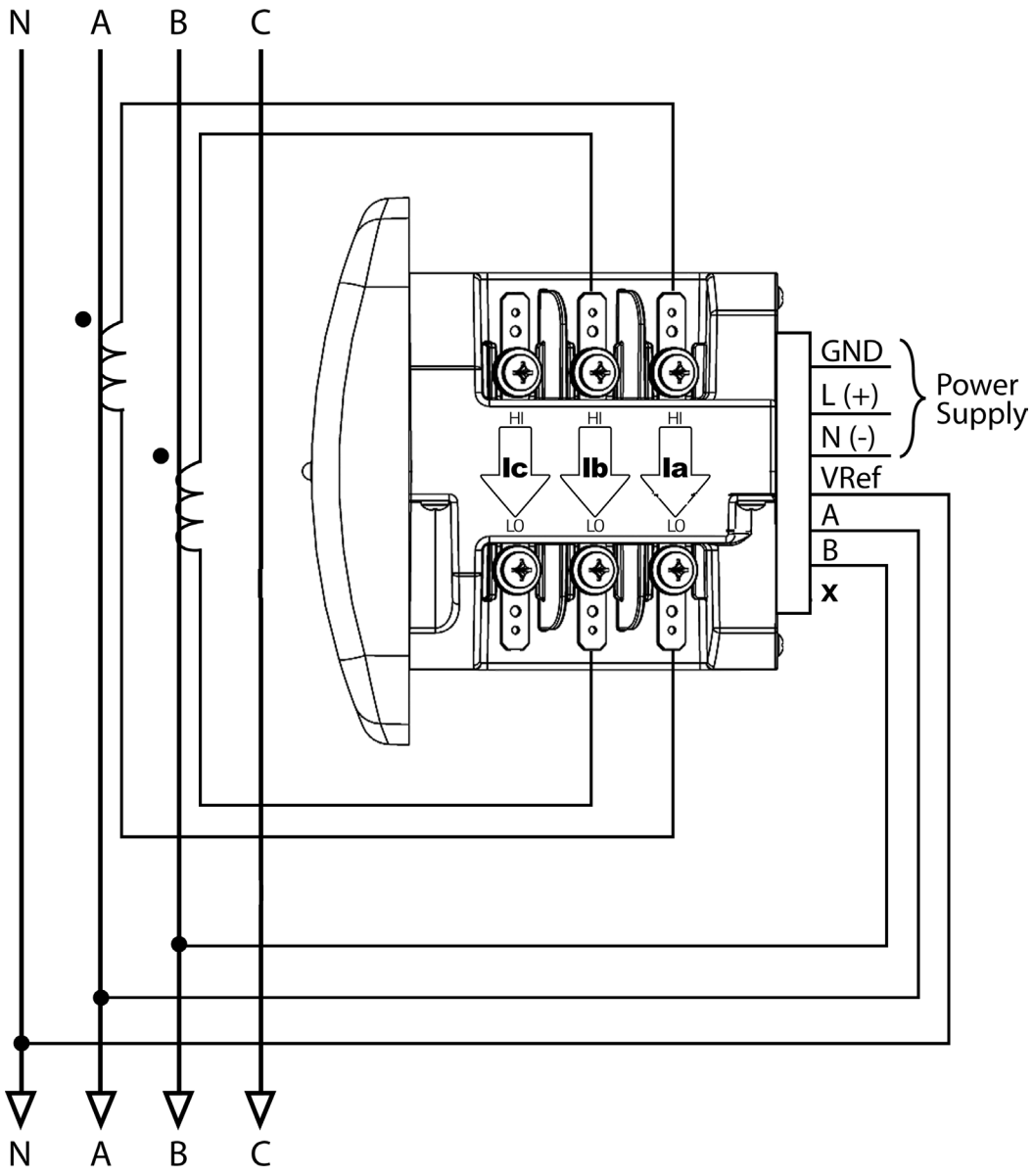
1. Three Phase, Four-Wire System Wye with Direct Voltage, 3 Element
   a. Example of dual Phase Hookup
   b. Example of Single Phase Hookup
2. Three Phase, Four-Wire System Wye with Direct Voltage, 2.5 Element
3. Three-Phase, Four-Wire Wye with PTs, 3 Element
4. Three-Phase, Four-Wire Wye with PTs, 2.5 Element
5. Three-Phase, Three-Wire Delta with Direct Voltage
6. Three-Phase, Three-Wire Delta with 2 PTs
7. Three-Phase, Three-Wire Delta with 3 PTs
8. Current Only Measurement (Three Phase)
9. Current Only Measurement (Dual Phase)
10. Current Only Measurement (Single Phase)

1. Service: WYE, 4-Wire with No PTs, 3 CTs

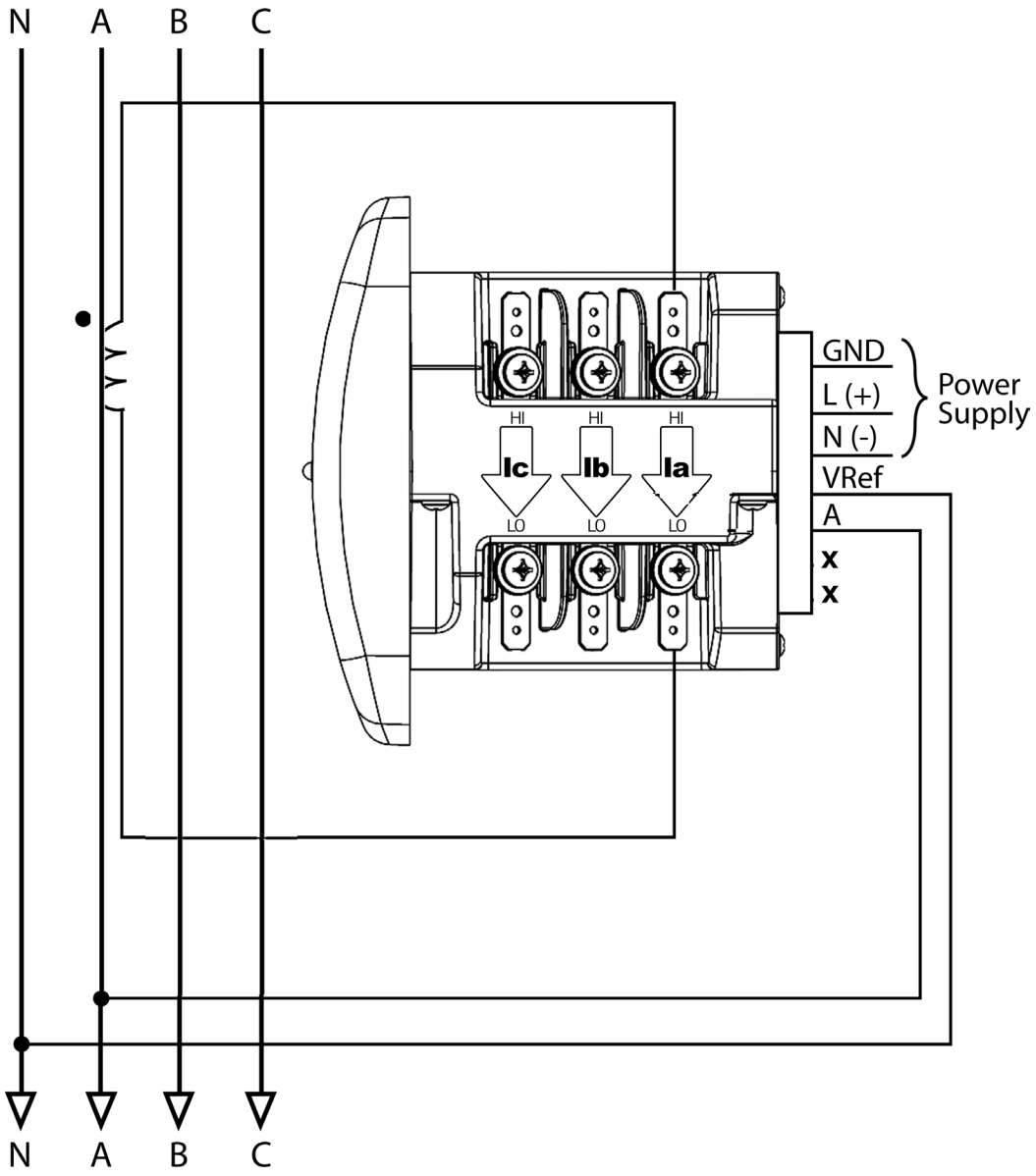


Select: "3 EL WYE" (3 Element Wye) in Meter Programming setup.

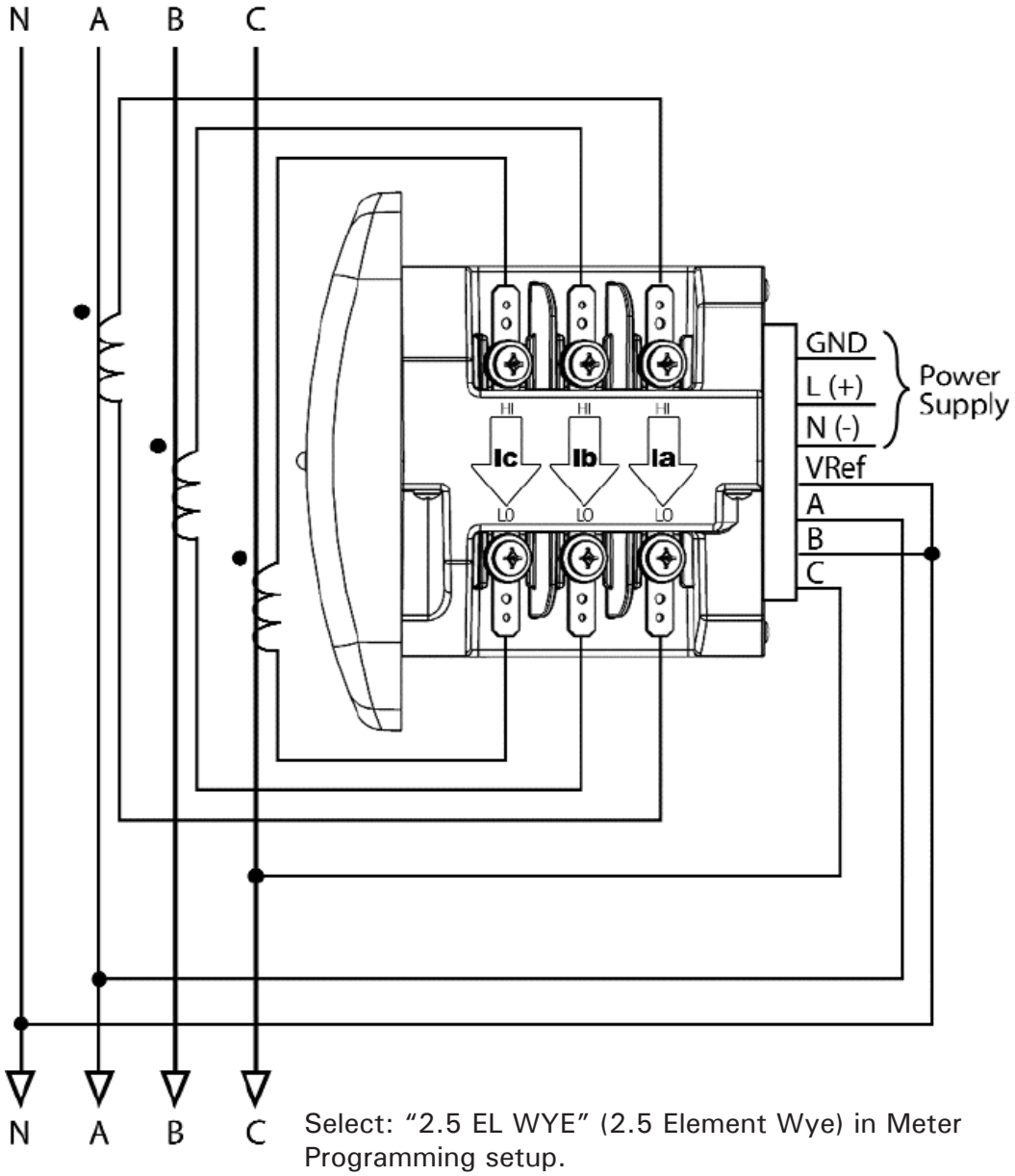
1a. Example of Dual Phase Hookup

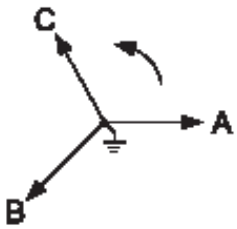


1b. Example of Single Phase Hookup



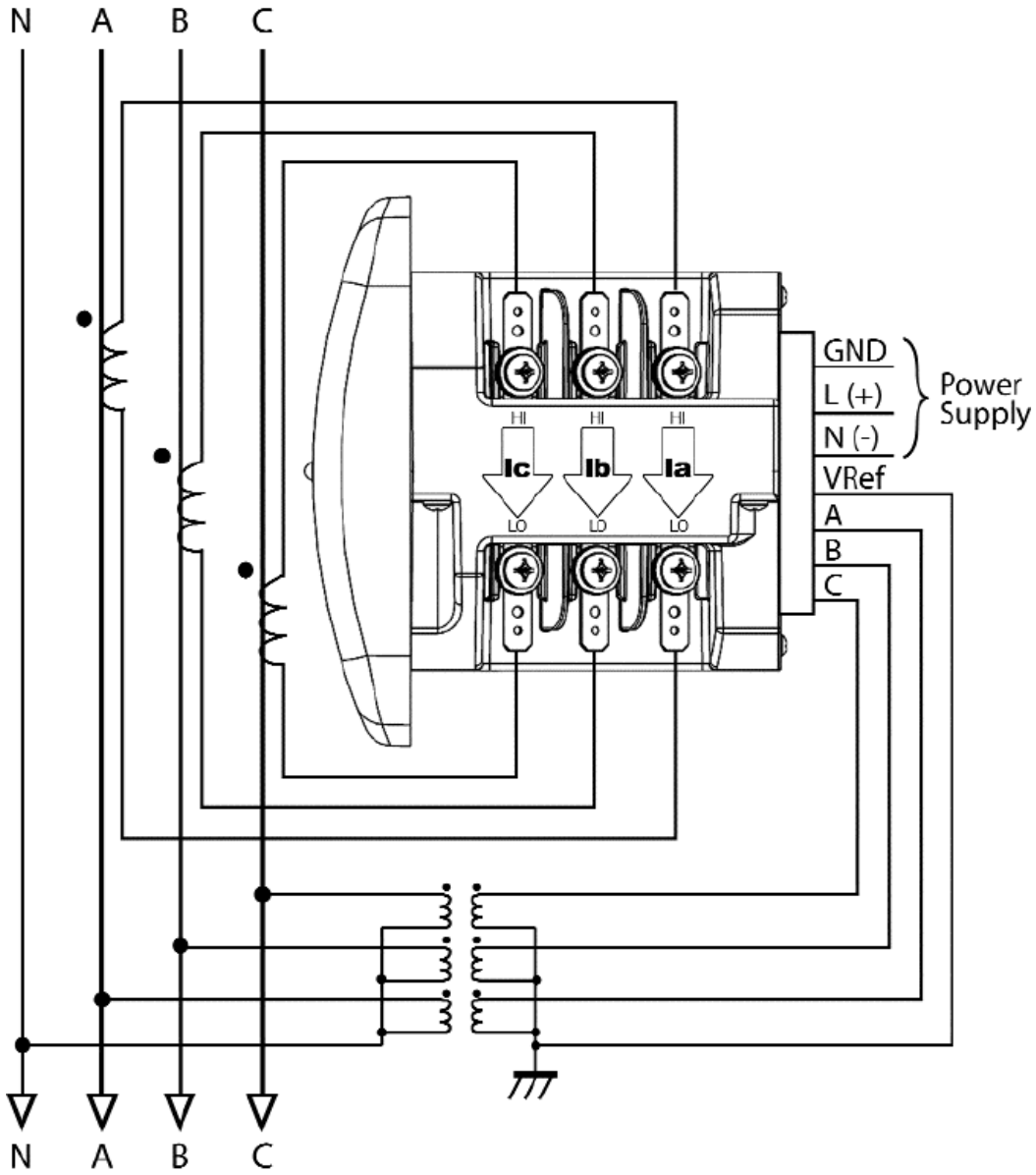
2. Service: 2.5 Element WYE, 4-Wire with No PTs, 3 CTs



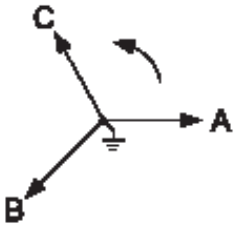


Select: "2.5 EL WYE" (2.5 Element Wye) in Meter Programming setup.

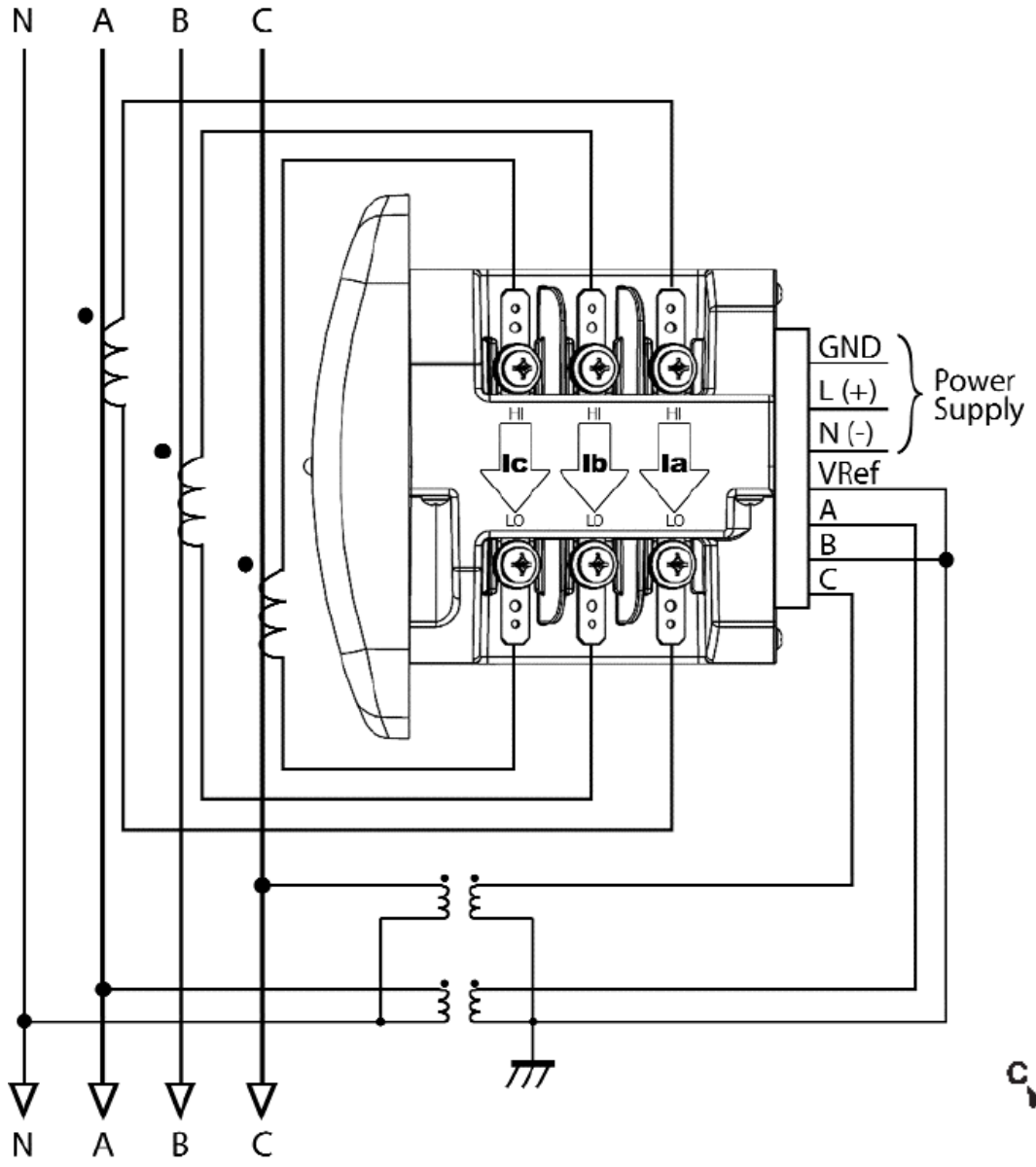
3. Service: WYE, 4-Wire with 3 PTs, 3 CTs

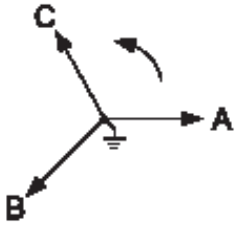


Select: "3 EL WYE" (3 Element Wye) in Meter Programming setup.



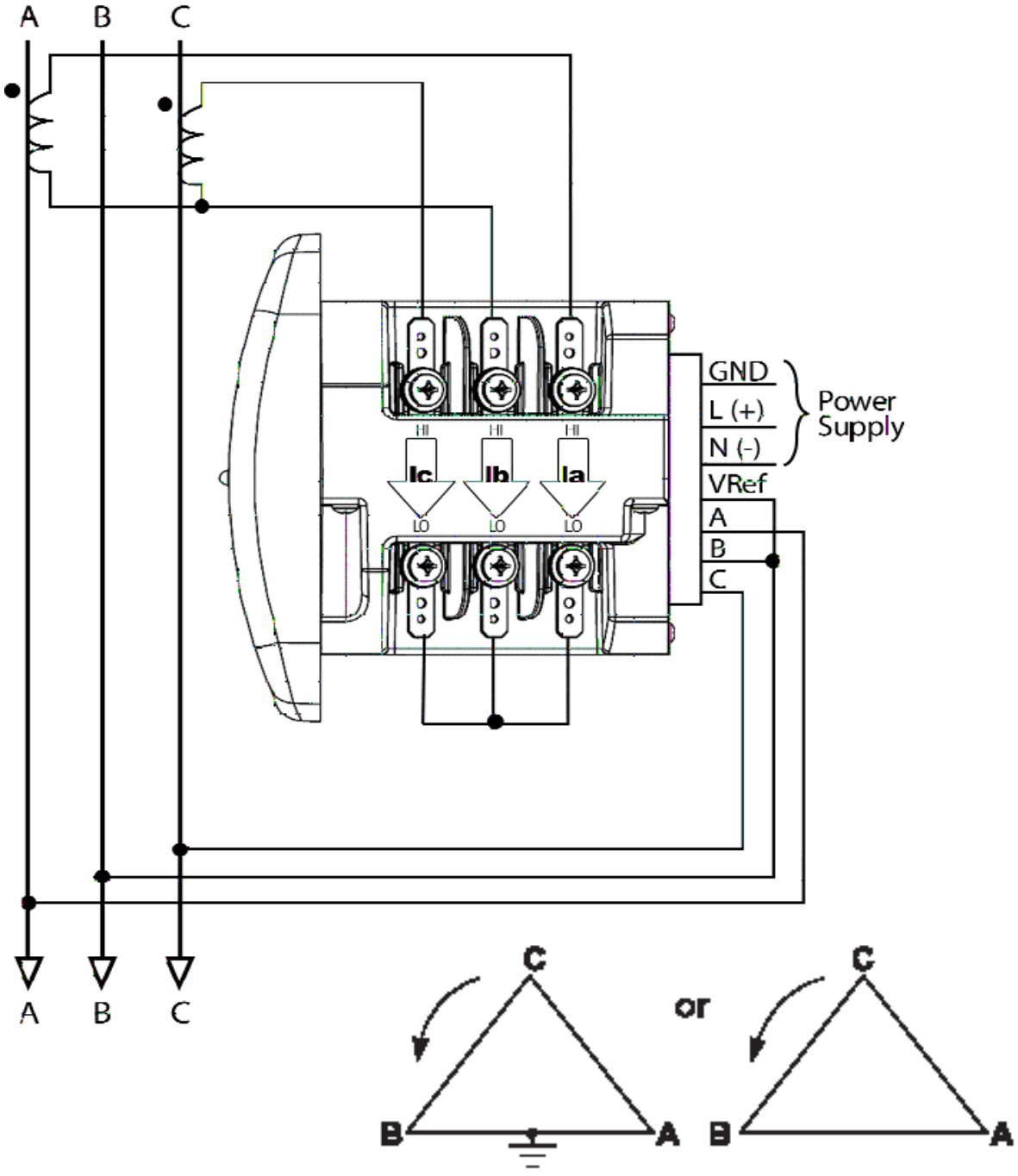
4. Service: 2.5 Element WYE, 4-Wire with 2 PTs, 3 CTs





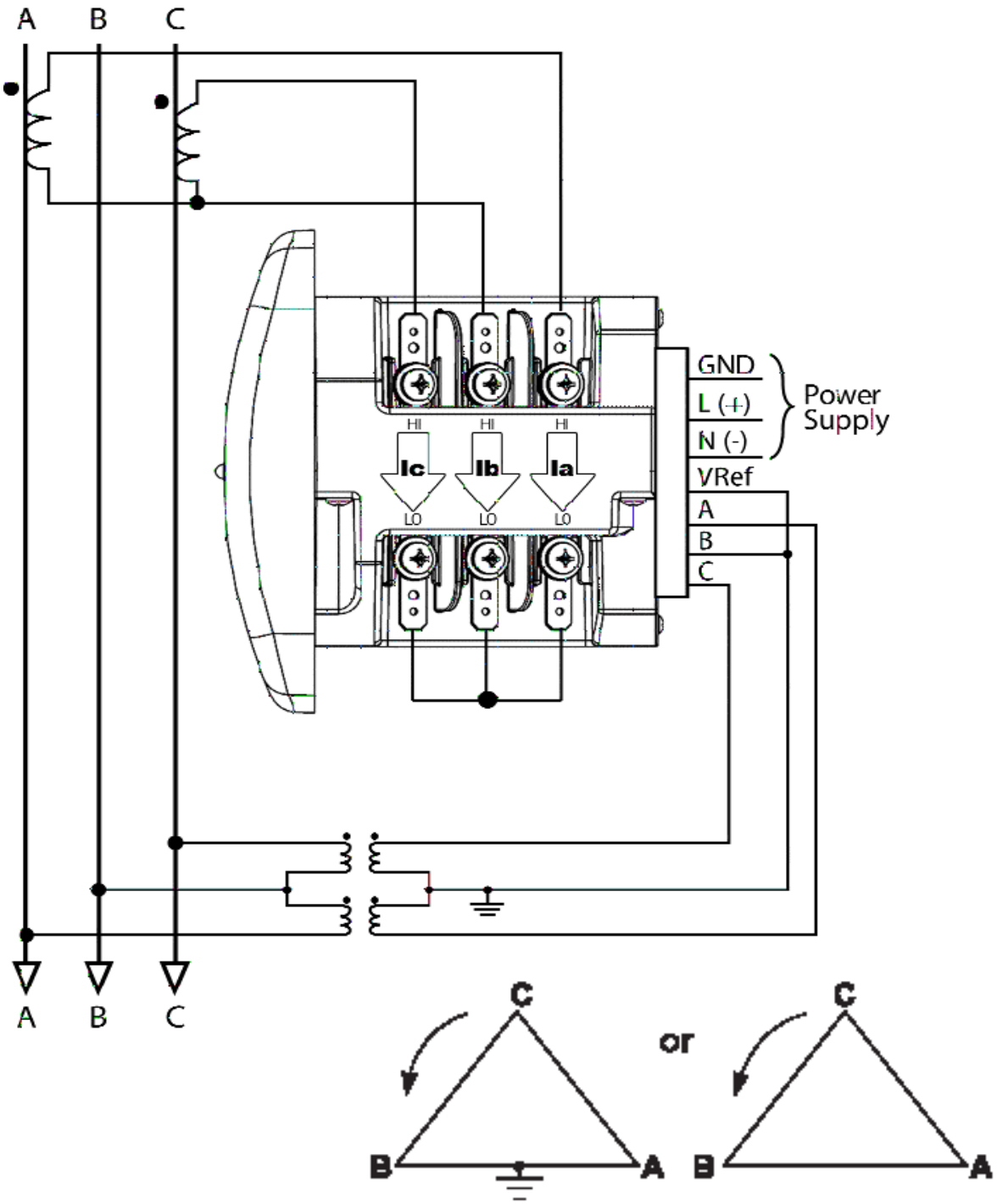
Select: "2.5 EL WYE" (2.5 Element Wye) in Meter Programming setup.

5. Service: Delta, 3-Wire with No PTs, 2 CTs



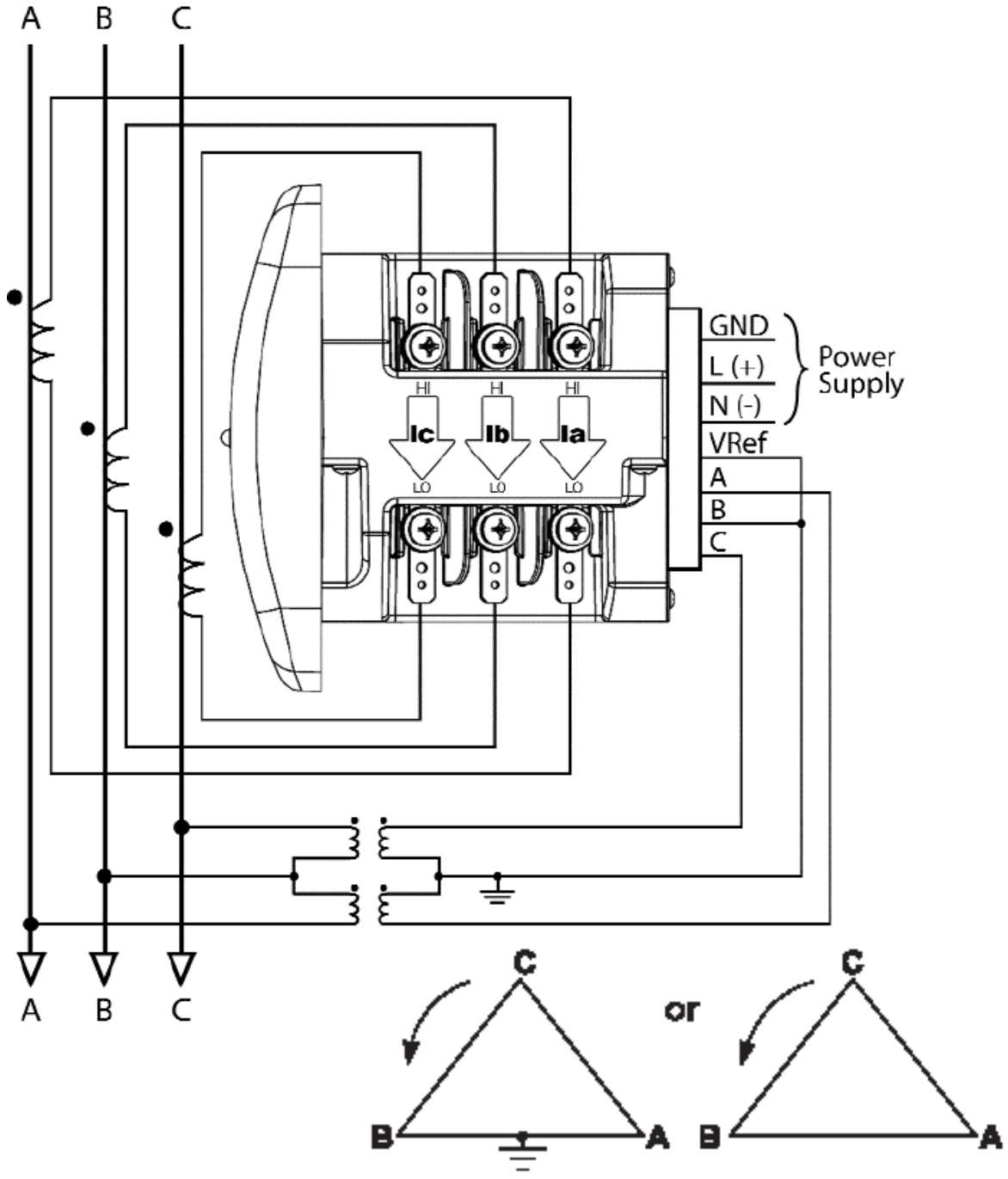
Select: "2 Ct dEL" (2 CT Delta) in Meter Programming setup.

6. Service: Delta, 3-Wire with 2 PTs, 2 CTs



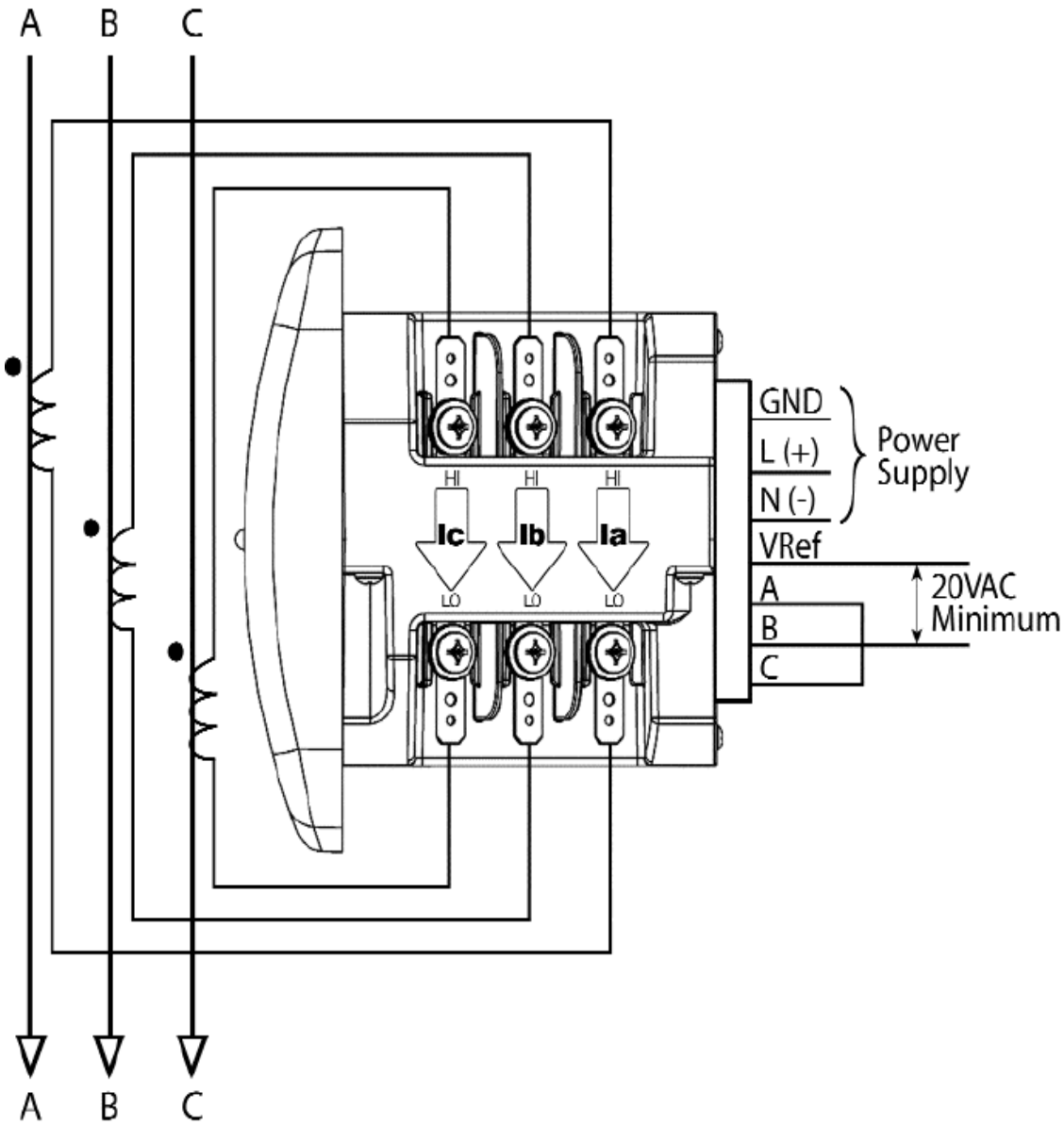
Select: "2 Ct dEL" (2 CT Delta) in Meter Programming setup.

7. Service: Delta, 3-Wire with 2 PTs, 3 CTs



Select: "2 Ct dEL" (2 CT Delta) in Meter Programming setup.

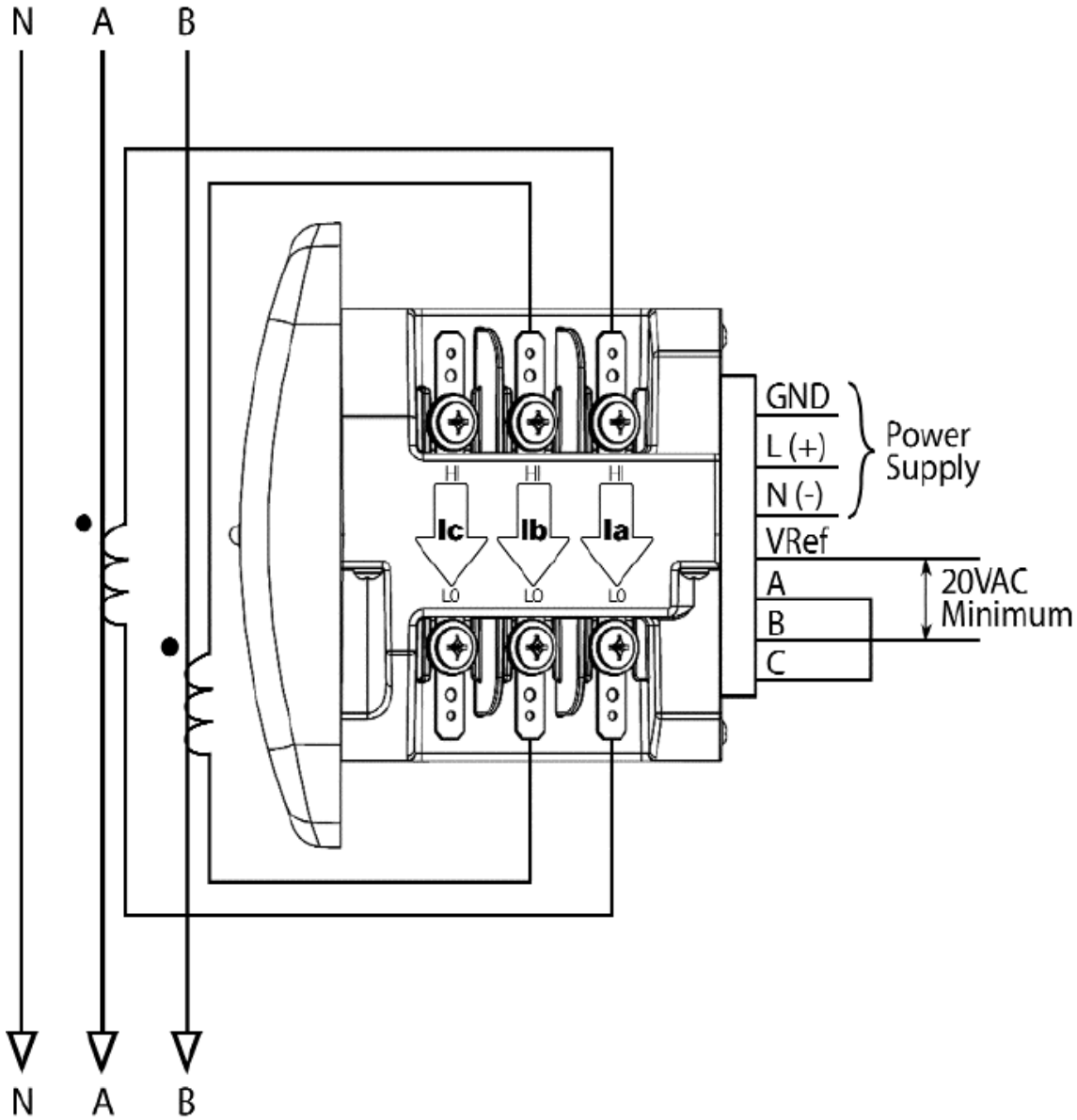
8. Service: Current Only Measurement (Three Phase)



Select: "3 EL WYE" (3 Element Wye) in Meter Programming setup.

* Even if the meter is used for only amp readings, the unit requires a Voltage reference.
Please make sure that the voltage input is attached to the meter.
AC Control Power can be used to provide the Reference Signal.

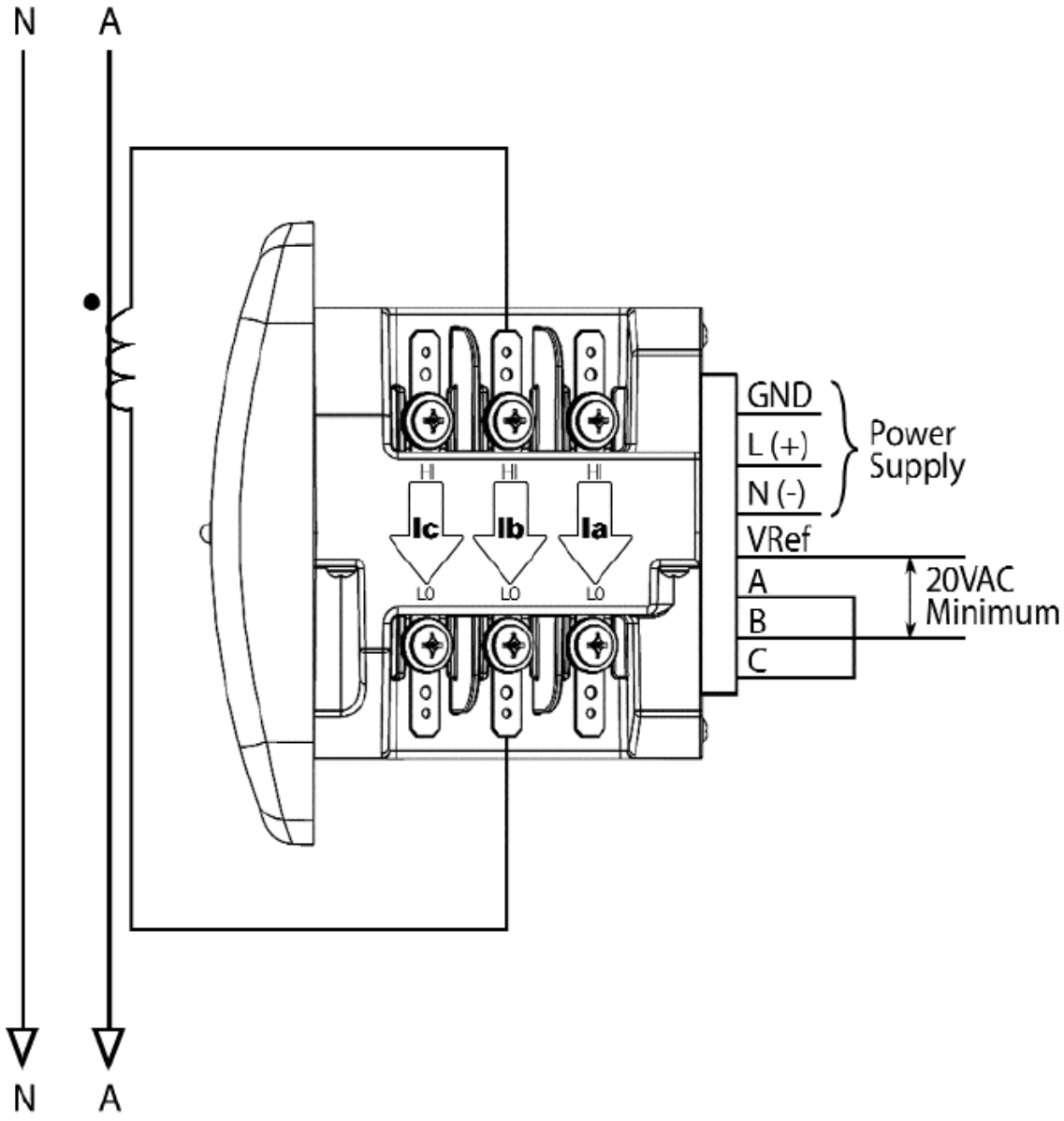
9. Service: Current Only Measurement (Dual Phase)



Select: "3 EL WYE" (3 Element Wye) in Meter Programming setup.

* Even if the meter is used for only amp readings, the unit requires a Voltage reference.
Please make sure that the voltage input is attached to the meter.
AC Control Power can be used to provide the Reference Signal.

10. Service: Current Only Measurement (Single Phase)



Select: "3 EL WYE" (3 Element Wye) in Meter Programming setup.

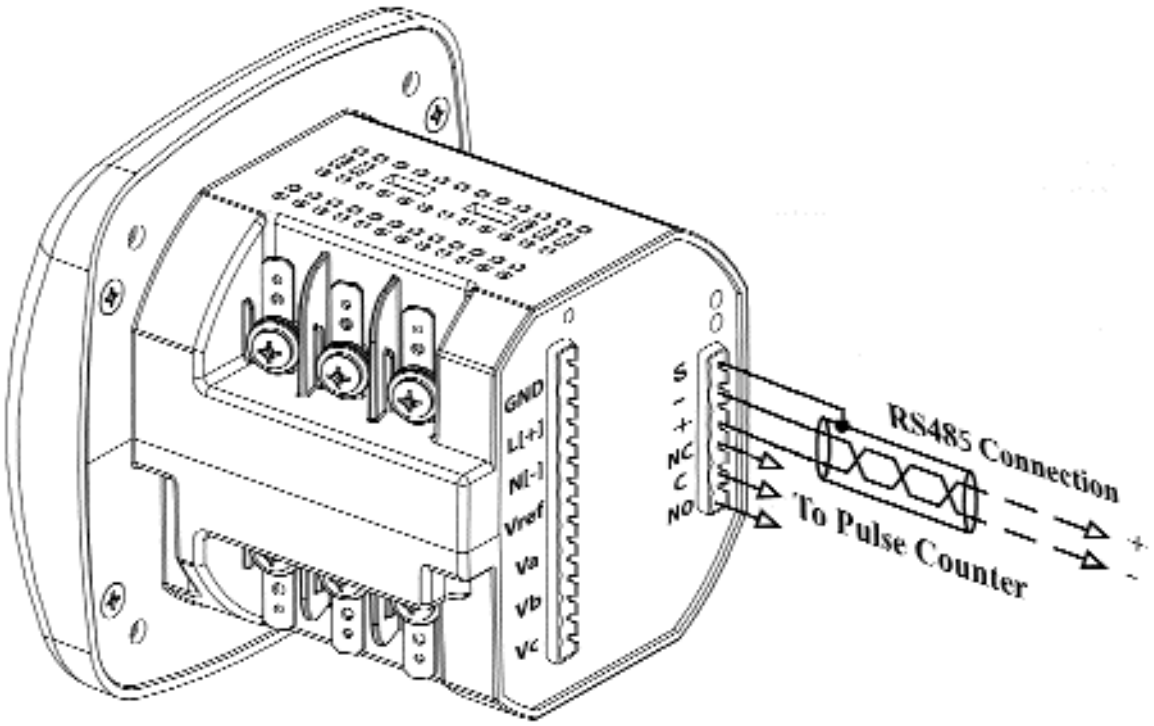
* Even if the meter is used for only amp readings, the unit requires a Voltage reference.
Please make sure that the voltage input is attached to the meter.
AC Control Power can be used to provide the Reference Signal.

IQ 100 Series Communication Installation

RS485 / KYZ Output (Communication Option)

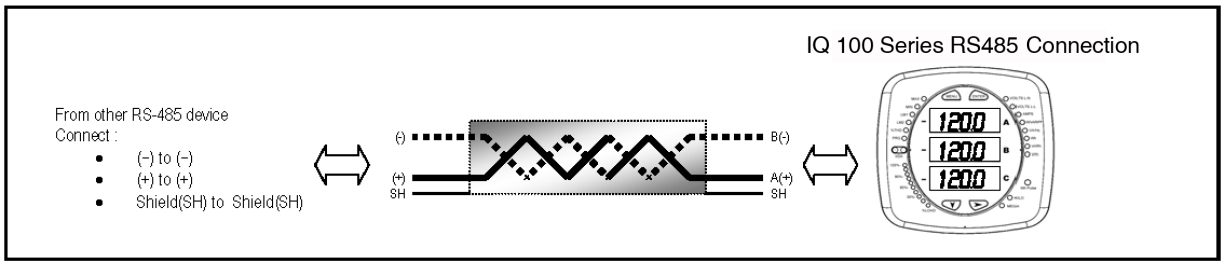
The IQ 100 Series meter provides an optional combined RS485/KYZ Pulse Output communication port,speaking Modbus ASCII or Modbus RTU.

- The IQ 100 Series meter's RS485 connection uses standard 2-Wire, Half Duplex Architecture. The RS485/KYZ Pulse Output connector is located on the terminal section of the meter. A connection can easily be made to a Master Device or to other Slave Devices.
- Care should be taken to connect + to + and - to - connections.
- See page 52 for the KYZ Output Specifications and Pulse constants.



- RS485 allows you to connect one or multiple IQ 100 Series meters to a PC or other device, at either a local or remote site. All RS485 connections are viable for up to 4000 feet (1219.20 meters).

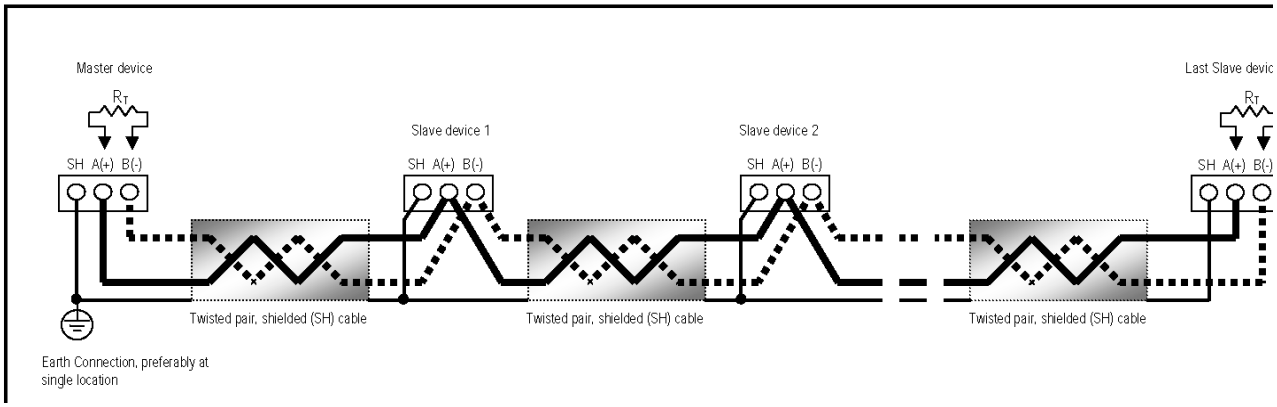
The figure below shows 2-wire RS485 connection in detail.

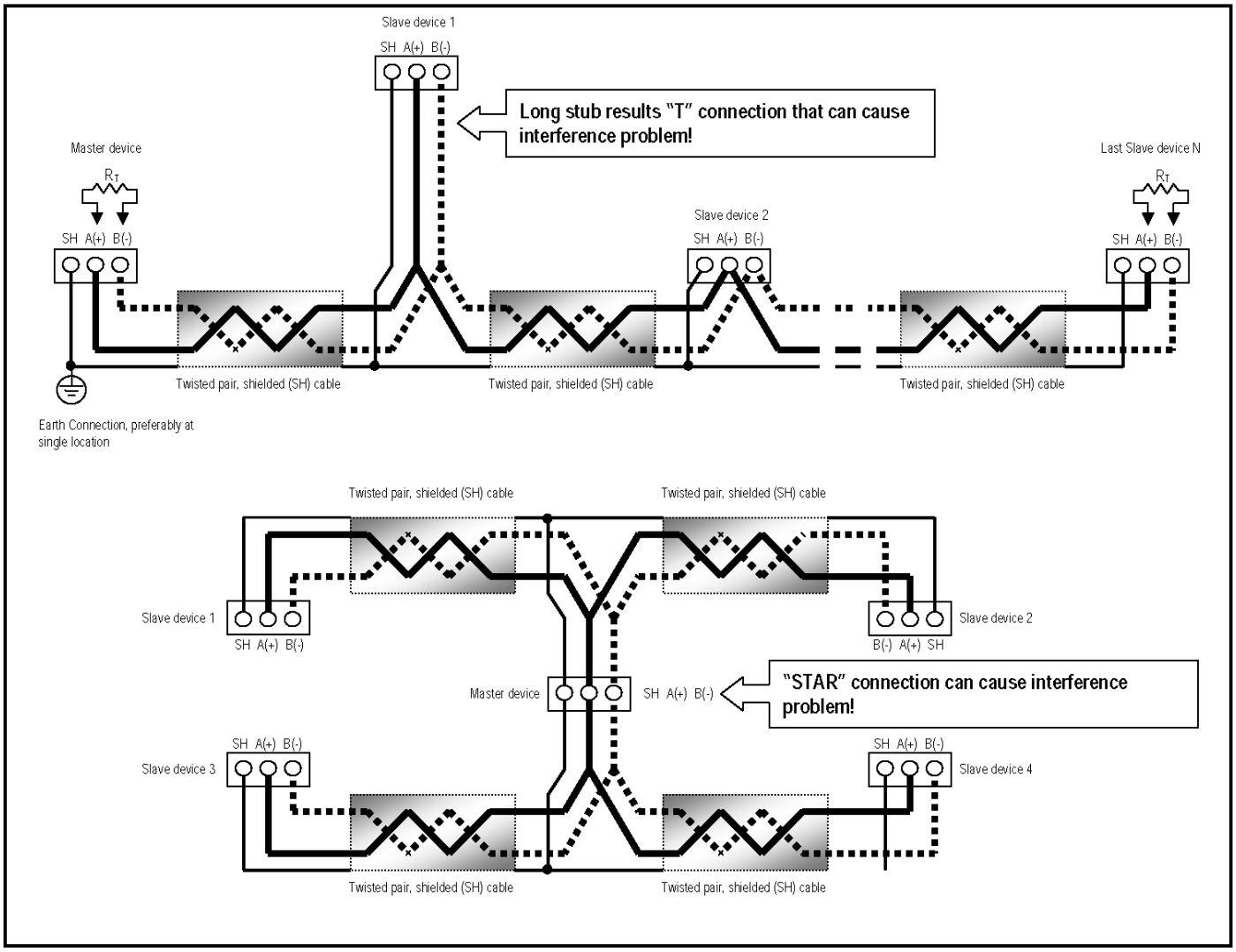


For All RS485 Connections:

- Use a shielded twisted pair cable 22 AWG (0.33 mm^2) or thicker, and ground the shield, preferably at one location only.
- Establish point-to-point configurations for each device on a RS485 bus: connect (+) terminals to (+) terminals; connect (-) terminals to (-) terminals.
- You may connect up to 31 meters on a single bus using RS485. Before assembling the bus, each meter must have a unique address.
- Protect cables from sources of electrical noise.
- Avoid both "Star" and "Tee" connections (see figure on the next page).
- **No more than two cables** should be connected **at any one point** on an RS485 network, whether the connections are for devices, converters, or terminal strips.
- Include all segments when calculating the total cable length of a network. If you are **not** using an RS485 repeater, the maximum length for cable connecting all devices is 4000 feet (1219.20 meters).
- Connect shield to RS485 Master and individual devices as shown in the figure below. You may also connect the shield to earth-ground at one point.
- **Termination Resistors** (R_T) may be needed on both ends for longer length transmission lines. How ever, since the meter has some level of termination internally, Termination Resistors may not be needed. When they are used, the value of the Termination Resistors is determined by the electrical parameters of the cable.

The figure below shows a representation of an RS485 Daisy Chain connection.




Slave device 1
SH A(+) B(-)
Long stub results "T" connection that can cause interference problem!
Master device
RT
SH A(+) B(-)
Slave device 2
SH A(+) B(-)
Last Slave device N
RT
SH A(+) B(-)
Twisted pair, shielded (SH) cable
Twisted pair, shielded (SH) cable
Twisted pair, shielded (SH) cable
Earth Connection, preferably at single location
Twisted pair, shielded (SH) cable
Twisted pair, shielded (SH) cable
Slave device 1
SH A(+) B(-)
Slave device 2
B(-) A(+) SH
Master device
SH A(+) B(-)
"STAR" connection can cause interference problem!
SH A(+) B(-)
Slave device 3
SH A(+) B(-)
Slave device 4
Twisted pair, shielded (SH) cable
Twisted pair, shielded (SH) cable

IQ 100 Series Transducer Communication Information

The IQ 100 SeriesTransducer model does not include a display or buttons on the front face of the meter. Programming and communication utilize the RS485 connection on the back face of the meter. Once a connection is established, Eaton Meter Configuration Software can be used to program the meter and communicate to IQ 100 Series slave devices. Refer to the chapter beginning on page 53 for instructions on using the software to program the meter.

Meter Connection

To provide power to the meter, attach an Aux cable to GND, L(+) and N(-) Refer to page 25.

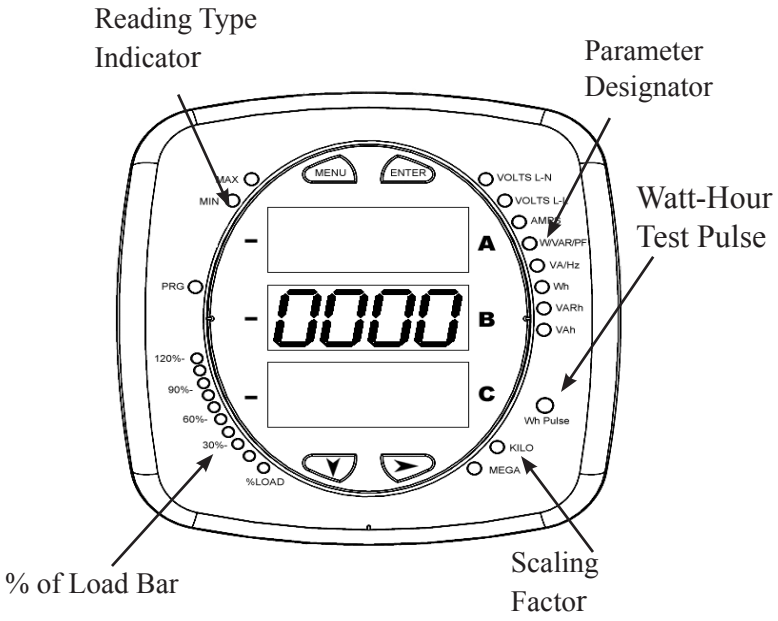
Programming the IQ 100 Series Meter Using the Front Panel

Introduction

You can use the Elements and Buttons on the IQ 100 Series meter's face to view meter readings, reset and/or configure the meter, and perform related functions. The following sections explain the Elements and Buttons and detail their use.

Understanding Meter Face Elements

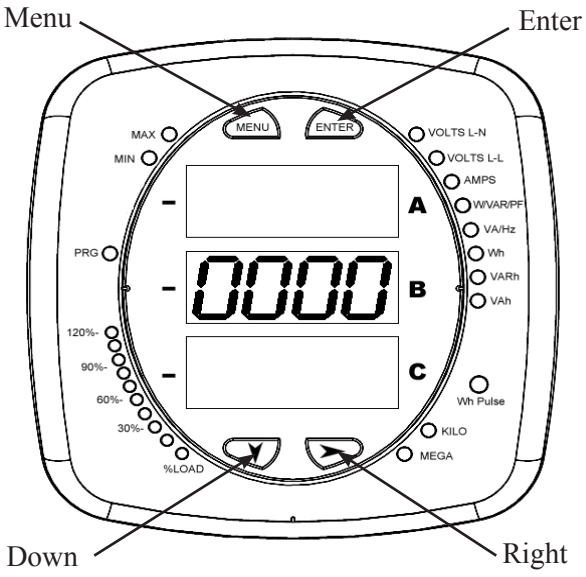
The meter face features the following elements:
- Reading Type Indicator:
  Indicates Type of Reading
- Parameter Designator:
  Indicates Reading Displayed
- Watt-Hour Test Pulse:
  Energy Pulse Output to Test Accuracy
- Scaling Factor:
  Kilo or Mega multiplier of Displayed Readings
- % of Load Bar:
  Graphic Display of Amps as % of the Load



Meter Faceplate Elements

Understanding Meter Face Buttons

The meter face has Menu, Enter, Down and Right buttons, which allow you to perform the following functions:
- View Meter Information
- Enter Display Modes
- Configure Parameters (may be Password Protected)
- Perform Resets (may be Password Protected)
- Perform LED Checks
- Change Settings
- View Parameter Values
- Scroll Parameter Values
- View Limit States



Meter Faceplate Buttons

Using the Front Panel

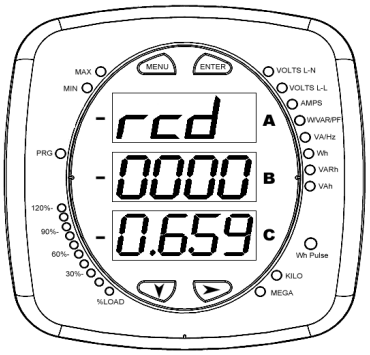
You can access the following modes using the meter's front panel buttons:
- Operating Mode (Default)
- Reset Mode
- Configuration Mode

Use the Menu, Enter, Down and Right buttons to navigate through each mode and its related screens.
NOTES:
- *Appendix A* contains the complete Navigation Map for the front panel display modes and their screens.
- The meter can also be configured using software (with optional communication); see the chapter beginning on page 53 for instructions.

Understanding Startup and Default Displays

Upon Power Up, the meter displays a sequence of screens:
- Lamp Test Screen where all LEDs are lit
- Lamp Test Screen where all digits are lit
- Firmware Screen showing build number
- Error Screen (if an error exists).

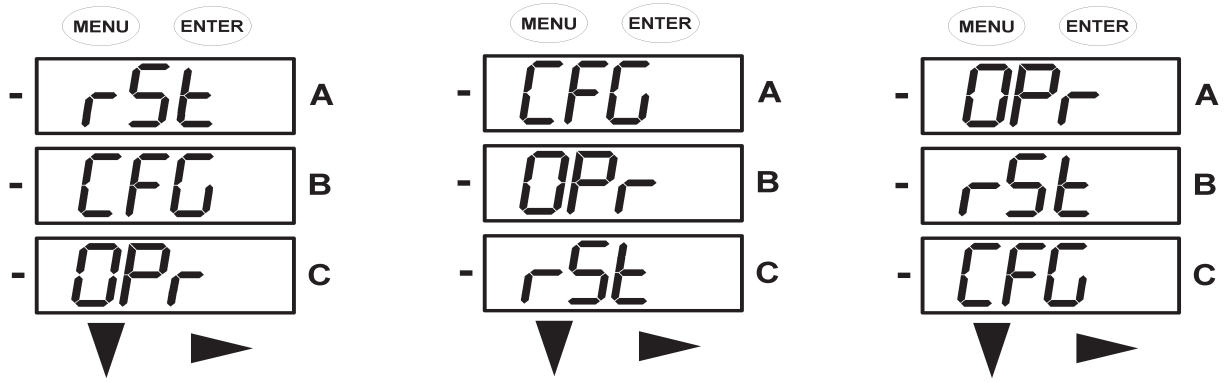
After startup, if auto-scrolling is enabled, the meter scrolls the parameter readings on the right side of the front panel. The Kilo or Mega LED lights, showing the scale for the Wh, VARh and VAh readings. The figure below shows an example of a Wh reading.



The meter continues to provide scrolling readings until one of the buttons on the front panel is pressed, causing the meter to enter one of the other Modes.

Using the Main Menu

1. Press the Menu button. The Main Menu screen appears.
   - The Reset mode (rSt) appears in the A window. Use the Down button to scroll, causing the Configuration (CFG) and Operating (OPr) modes to move to the A window.
   - The mode that is currently flashing in the A window is the "Active" mode, which means it is the mode that can be configured.

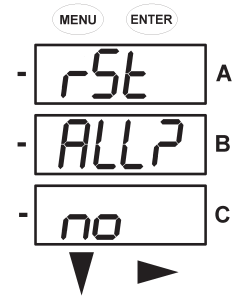


For example: Press Down Once- CFG moves to A window. Press Down Once - OPr moves to A window.

2. Press the Enter button from the Main Menu to view the Parameters screen for the mode that is currently active.

Using Reset Mode

Reset Mode resets **all** of the Max and Min values in the meter.
NOTE: With the communication option, you can reset both the Max/Min values and the energy accumulators. If you do not have the communication option, you cannot reset the energy accumulator fields.

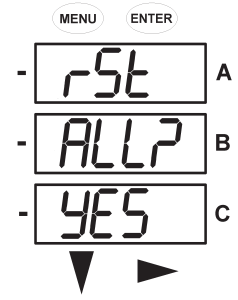


Press the Enter button while rSt is in the A window. The Reset All? No screen appears.

- If you press the Enter button again, the Main Menu appears, with the next mode in the A window. (The Down button does not affect this screen.)

- If you press the Right button, the Reset All? YES screen appears. Press Enter to reset the meter's Max and Min values.

CAUTION! Reset All? YES resets **all** Max and Min values. Only press Enter if this is what you want to do.



NOTE: If Password Protection is enabled for Reset, you must enter the four digit Password before you can reset the meter. (See page 58 for information on Password Protection.)
To enter a password, follow the instructions on the next page.

Once you have performed a reset, the screen displays "rSt All donE" and then resumes auto-scrolling parameters.

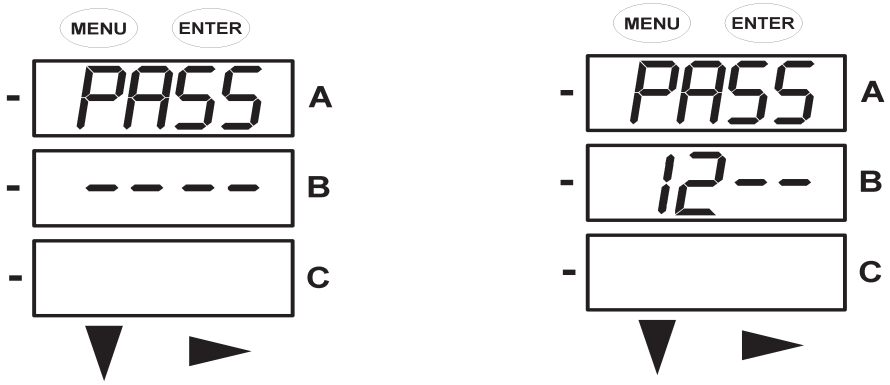
Entering a Password

If Password Protection has been enabled in the software for Reset and/or Configuration (see page 58 for information), a screen appears requesting a Password when you try to reset the meter and/or configure settings through the front panel.

- PASS appears in the A window and 4 dashes appear in the B window. The leftmost dash is flashing.

1. Press the Down button to scroll numbers from 0 to 9 for the flashing dash. When the correct number appears for that dash, use the the Right button to move to the next dash.

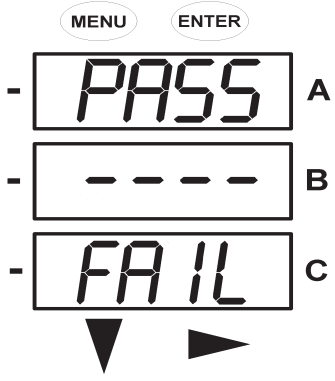
   Example: The left screen, below, shows four dashes. The right screen shows the display after the first two digits of the password have been entered.



2. When all 4 digits of the password have been selected, press the Enter button.

   - If you are in Reset Mode and the correct Password has been entered, "rSt All donE" appears and the screen resumes auto-scrolling parameters.
   - If you are in Configuration Mode and the correct Password has been entered, the display returns to the screen that required a password.

   - If an incorrect Password has been entered, "PASS ---- FAIL" appears, and:
     - The previous screen is redisplayed, if you are in Reset Mode.
     - The previous Operating Mode screen is redisplayed, if you are in Configuration Mode.

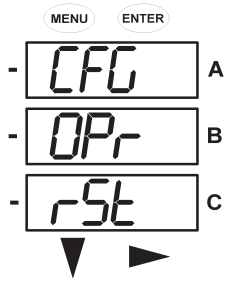


Using Configuration Mode

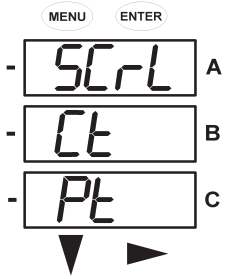
Configuration Mode follows Reset: Energy on the Main Menu.

To access Configuration Mode:

1. Press the Menu button while the meter is auto-scrolling parameters.
2. Press the Down button until the Configuration Mode option (CFG) is in the A window.
3. Press the Enter button. The Configuration Parameters screen appears.
4. Press the Down button to scroll through the configuration parameters: Scroll (SCrL), CT, PT, Connection (Cnct) and Port. The parameter currently 'Active," i.e., configurable, flashes in the A window.
5. Press the Enter button to access the Setting screen for the currently active parameter.
   NOTE: You can use the Enter button to scroll through all of the Configuration parameters and their Setting screens, in order.



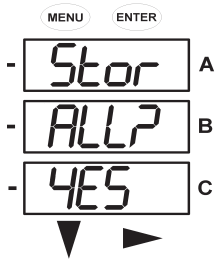
Press Enter when CFG is in A window -



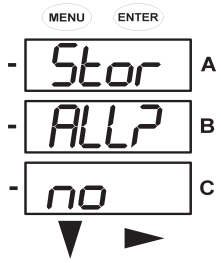
Parameter screen appears - Press Down-
Press Enter when Parameter you want is in A window

6. The parameter screen appears, showing the current settings. To change the settings:
   - Use either the Down button or the Right button to select an option.
   - To enter a number value, use the Down button to select the number value for a digit and the Right button to move to the next digit.

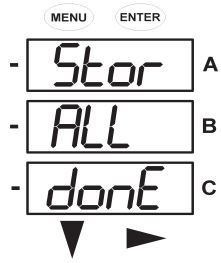
   NOTE: When you try to change the current setting and Password Protection is enabled for the meter, the Password screen appears. See the previous page for instructions on entering a password.
7. Once you have entered the new setting, press the Menu button twice.
8. The Store ALL YES screen appears. You can either:
   - Press the Enter button to save the new setting.
   - Press the Right button to access the Store ALL no screen; then press the Enter button to cancel the Save.
9. If you have saved the settings, the Store ALL done screen appears and the meter resets.



Press the Enter button to save the settings
Press the Right button for Stor All no screen



Press the Enter button to
Cancel the save



The settings have been saved

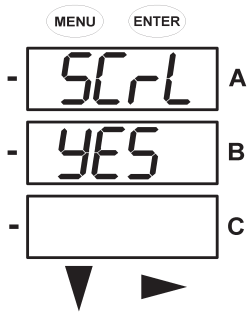
Configuring the Scroll Feature

When in Auto Scroll mode, the meter performs a scrolling display, showing each parameter for 7 seconds, with a 1 second pause between parameters. The parameters that the meter displays are determined by the following conditions:

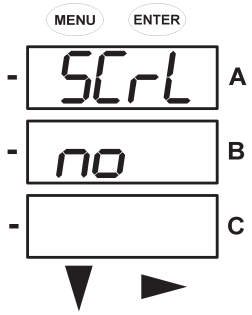
- They have been selected through software. (Refer to the chapter beginning on page 53 for instructions.)
- Your meter model (IQ130/140 or 150).

To enable or disable Auto-scrolling:

1. Press the Enter button when SCrl is in the A window.
   The Scroll YES screen appears.



2. Press either the Right or Down button if you want to access the Scroll no screen.
   To return to the Scoll YES screen, press either button.



3. Press the Enter button on either the Scroll YES screen (to enable auto-scrolling) or the Scroll no screen (to disable auto-scrolling).
   The CT- n screen appears (this is the next Configuration mode parameter).

NOTE:

- To exit the screen without changing scrolling options, press the Menu button.
- To return to the Main Menu screen, press the Menu button twice.
- To return to the scrolling (or non-scrolling) parameters display, press the Menu button three times.

Configuring CT Setting

The CT Setting has three parts: Ct-n (numerator), Ct-d (denominator), and Ct-S (scaling).

1. Press the Enter button when Ct is in the A window.
   The Ct-n screen appears. You can either:
   - Change the value for the CT numerator.
   - Access one of the other CT screens by pressing the Enter button: press Enter once to access the Ct-d screen, twice to access the Ct-S screen.

   NOTE: The Ct-d screen is preset to a 5 Amp or 1 Amp value at the factory and cannot be changed.

   a. To change the value for the CT numerator, from the Ct-n screen:
      - Use the Down button to select the number value for a digit.
      - Use the Right button to move to the next digit.

   b. To change the value for CT scaling, from the Ct-S screen:
      Use the Right button or the Down button to choose the scaling you want. The Ct-S setting can be 1, 10, or 100.
      NOTE: If you are prompted to enter a password, refer to the instructions earlier in the chapter.

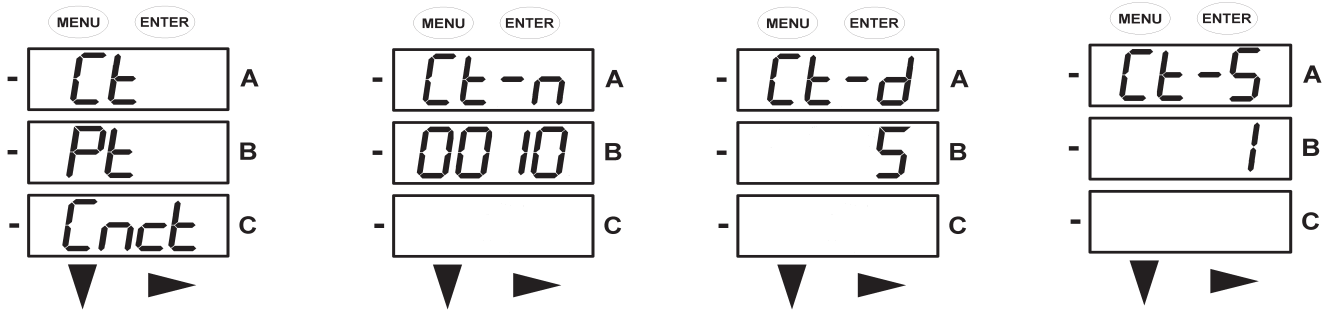
2. When the new setting is entered, press the Menu button twice.

3. The Store ALL YES screen appears. Press Enter to save the new CT setting.

Example CT Settings:

200/5 Amps:	Set the Ct-n value for 200 and the Ct-S value for 1.
800/5 Amps:	Set the Ct-n value for 800 and the Ct-S value for 1.
2,000/5 Amps:	Set the Ct-n value for 2000 and the Ct-S value for 1.
10,000/5 Amps:	Set the Ct-n value for 1000 and the Ct-S value for 10.

NOTES:
- The value for Amps is a product of the Ct-n value and the Ct-S value.
- Ct-n and Ct-S are dictated by primary current; Ct-d is secondary current.



Press Enter | Use buttons to set Ct-n value | The Ct-d can't be changed | Use buttons to select scaling

Configuring PT Setting

The PT Setting has three parts: Pt-n (numerator), Pt-d (denominator), and Pt-S (scaling).

1. Press the Enter button when Pt is in the A window.
   The PT-n screen appears. You can either:
   - Change the value for the PT numerator.
   - Access one of the other PT screens by pressing the Enter button: press Enter once to access the Pt-d screen, twice to access the Pt-S screen.

   a. To change the value for the PT numerator or denominator, from the Pt-n or Pt-d screen:
      - Use the Down button to select the number value for a digit.
      - Use the Right button to move to the next digit.
   b. To change the value for the PT scaling, from the Pt-S screen:
      Use the Right button or the Down button to choose the scaling you want. The Pt-S setting can be 1, 10, 100, or 1000.

   NOTE: If you are prompted to enter a password, refer to the instructions earlier in this chapter.

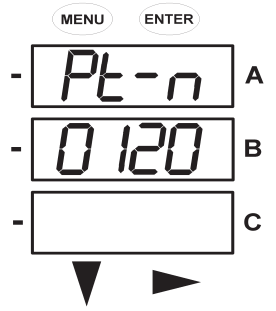
2. When the new setting is entered, press the Menu button twice.

3. The STOR ALL YES screen appears. Press Enter to save the new PT setting.

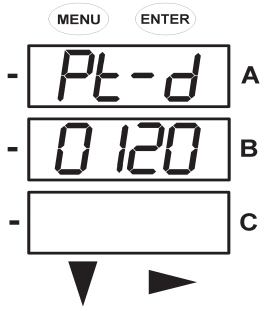
Example Settings:

277/277 Volts:	Pt-n value is 277, Pt-d value is 277, Pt-S value is 1.
14,400/120 Volts:	Pt-n value is 1440, Pt-d value is 120, Pt-S value is 10.
138,000/69 Volts:	Pt-n value is 1380, Pt-d value is 69, Pt-S value is 100.
345,000/115 Volts:	Pt-n value is 3450, Pt-d value is 115, Pt-S value is 100.
345,000/69 Volts:	Pt-n value is 345, Pt-d value is 69, Pt-S value is 1000.

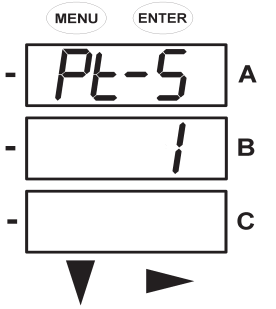
NOTE: Pt-n and Pt-S are dictated by primary voltage; Pt-d is secondary voltage.



Use buttons to set Pt-n value



Use buttons to set Pt-d value

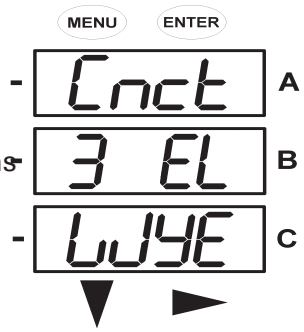


Use buttons to select scaling

Configuring Connection Setting

1. Press the Enter button when Cnct is in the A window. The Cnct screen appears.
2. Press the Right button or Down button to select a configuration.
   The choices are:
   - 3 Element Wye (3 EL WYE)
   - 2.5 Element Wye (2.5EL WYE)
   - 2 CT Delta (2 Ct dEL)

   NOTE: If you are prompted to enter a password, refer to the instructions earlier in this chapter.
3. When you have made your selection, press the Menu button twice.
4. The STOR ALL YES screen appears. Press Enter to save the setting.



Use buttons to select configuration

Configuring Communication Port Setting

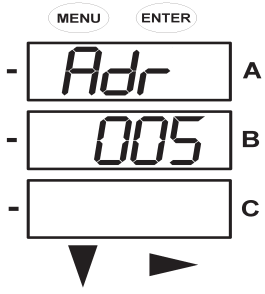
Port configuration consists of : Address (a three digit number), Baud Rate (9600; 19200; 38400; or 57600), and Protocol (Modbus RTU or Modbus ASCII).

1. Press the Enter button when POrt is in the A window.
   The Adr (address) screen appears. You can either:
   - Enter the address.
   - Access one of the other Port screens by pressing the Enter button: press Enter once to access the bAUd screen (Baud Rate); press Enter twice to access the Prot screen (Protocol).

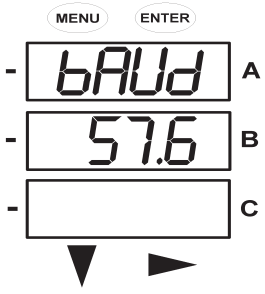
   a. To enter the Address, from the Adr screen:
      - Use the Down button to select the number value for a digit.
      - Use the Right button to move to the next digit.

   b. To select the Baud Rate, from the bAUd screen:
      Use the Right button or the Down button to select the setting you want.

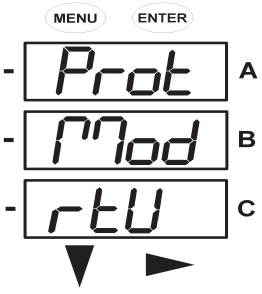
   c. To select the Protocol, from the Prot screen:
      Press the Right button or the Down button to select the setting you want.
      NOTE: If you are prompted to enter a password, refer to the instructions earlier in this chapter.
2. When you have finished making your selections, press the Menu button twice.
3. The STOR ALL YES screen appears. Press Enter to save the settings.



Use buttons to enter Address



Use buttons to select Baud Rate



Use buttons to select Protocol

Using Operating Mode

Operating Mode is the IQ 100 Series meter's default mode, that is, the standard front panel display. After Startup, the meter automatically scrolls through the parameter screens, if scrolling is enabled. Each parameter is shown for 7 seconds, with a 1 second pause between parameters. Scrolling is suspended for 3 minutes after any button is pressed.

1. Press the Down button to scroll all the parameters in Operating Mode. The currently "Active," i.e., displayed, parameter has the Indicator light next to it, on the right face of the meter.
2. Press the Right button to view additional readings for that parameter. The table below shows possible readings for Operating Mode. Sheet 2 in *Appendix A* shows the Operating Mode Navigation Map. NOTE: Readings or groups of readings are skipped if not applicable to the meter type or hookup, or if they are disabled in the programmable settings.

OPERATING MODE PARAMETER READINGS

POSSIBLE READINGS

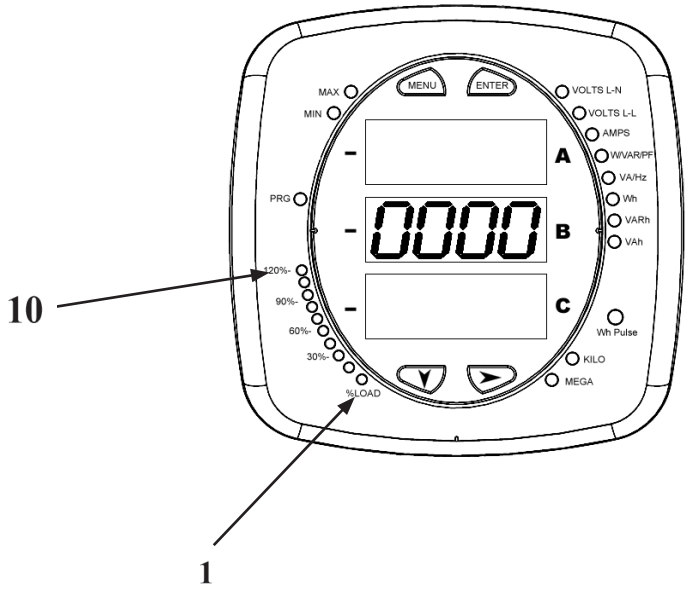
VOLTS L-N	VOLTS_LN	VOLTS_LN_MAX	VOLTS_LN_MIN	
VOLTS L-L	VOLTS_LL	VOLTS_LL_MAX	VOLTS_LL_MIN	
AMPS	AMPS	AMPS_NEUTRAL	AMPS_MAX	AMPS_MIN
W/VAR/PF	W_VAR_PF	W_VAR_PF_MAX_POS	W_VAR_PF_MIN_POS	W_VAR_PF_MIN_NEG
VA/Hz	VA_FREQ	VA_FREQ_MAX	VA_FREQ_MIN	
Wh	KWH_REC	KWH_DEL	KWH_NET	KWH_TOT
VARh	KVARH_POS	KVARH_NEG	KVARH_NET	KVARH_TOT
VAh	KVAH			

Understanding the % of Load Bar

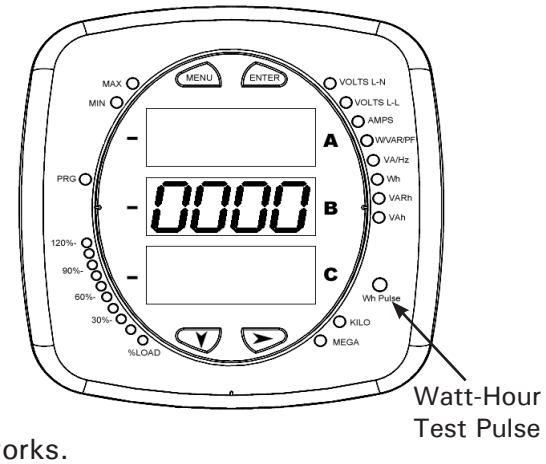
The 10-segment LED bar graph at the bottom left of the IQ 100 Series front panel provides a graphic representation of Amps. The segments light according to the load, as shown in the % Load Segment Table below.
When the Load is over 120% of Full Load, all segments flash "On" (1.5 secs) and "Off" (0.5 secs).

% of Load Segment Table

Segments	Load > = % Full Load
none	no load
1	1%
1-2	15%
1-3	30%
1-4	45%
1-5	60%
1-6	72%
1-7	84%
1-8	96%
1-9	108%
1-10	120%
All Blink	>120%

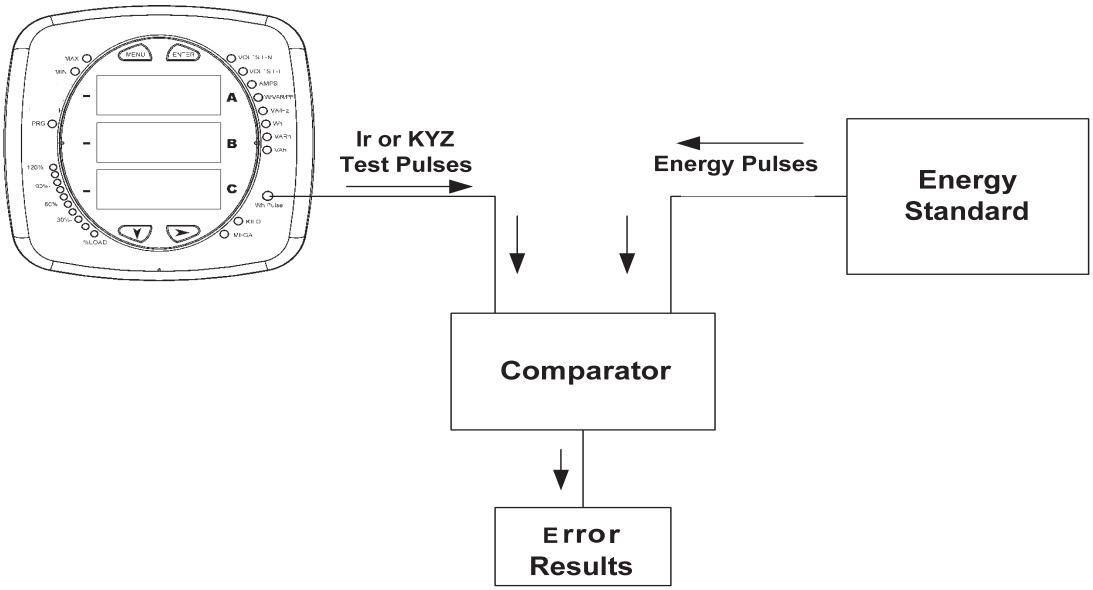


Performing Watt-Hour Accuracy Testing (Verification)



To be certified for revenue metering, power providers and utility companies must verify that the billing energy meter performs to the stated accuracy. To confirm the meter's performance and calibration, power providers use field test standards to ensure that the unit's energy measurements are correct. Since the IQ 100 Series meter is a traceable revenue meter, it contains a utility grade test pulse that can be used to gate an accuracy standard. This is an essential feature required of all billing grade meters.

- Refer to the figure below for an example of how this process works.
- Refer to the table below for the Wh/Pulse Constants for Accuracy Testing.



Using the Watt-Hour Test Pulse

Infrared & KYZ Pulse Constants for Accuracy Testing - Kh Watthour per pulse

Input Voltage Level	Class 10 Models	Class 2 Models
Below 150V	0.2505759630	0.0501151926
Above 150V	1.0023038521	0.2004607704

NOTE: Minimum pulse width is 90 milliseconds.

Programming the IQ 100 Series Meter Using Software

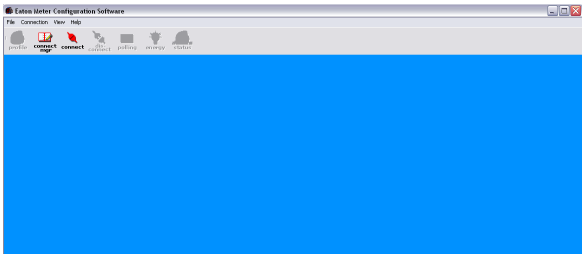
Overview

The IQ 100 Series meter can be configured using either the meter Face Buttons (Menu, Enter, Down and Right) or Eaton Meter Configuration Software. To connect to the meter for software configuration, use the RS485 port, if equipped, on the back panel of the meter.

The IQ 100 Series Transducer must be configured with the Eaton Meter Configuration Software, using the RS485 port, since it does not have a front panel.

This chapter contains instructions for programming the meter and Transducer using software.

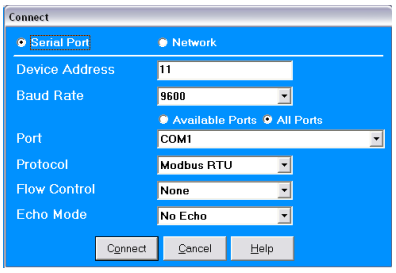
Connecting to the IQ 100 Series Meter/Transducer



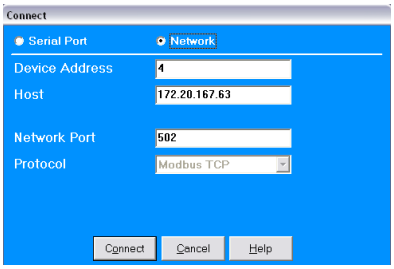
1. Open Eaton Meter Configuration Software.

2. Click the Connect icon on the Title bar or Connection > Quick Connect.

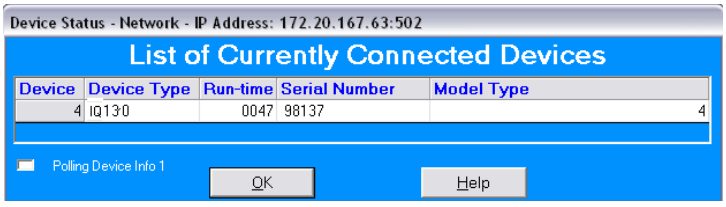
3. <u>If you are connecting to the meter through your PC</u>:
   a. Make sure the Serial Port radio button is selected.
   b. Enter Device Address (1-249).
   c. Select Baud Rate from the pull-down menu.
   d. Select the port you are using from the pull-down menu. The Available Ports/All Ports radio buttons determine which port selections the menu displays.
   e. Select Modbus RTU from the Protocol pull-down menu.
   f. Select Flow Control: None or Hardware.
   g. Select Echo Mode: No Echo or Static Echo.



   <u>If you are connecting to the meter through the Power Xpert® Gateway</u>:
   a. Make sure the Network radio button is selected.
   b. Enter Device Address (1-247).
   c. Enter the Gateway's IP Address.
   d. Enter Network Port.
   e. Protocol defaults to Modbus TCP.



4. Click the Connect button. You will see the Device Status screen, shown below on the right.



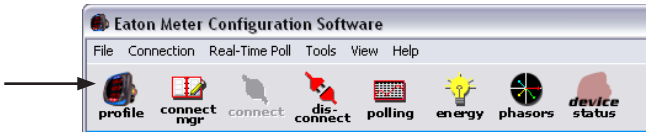
NOTE for IQ 100 Series Transducer:
When the Transducer is powered up, for 10 seconds you can connect to the meter using the Factory Initial Default Settings (even if the Device Profile has been changed). After 10 seconds, the Device Profile reverts to the actual Device Profile in use.

Factory Initial Default Settings

Baud Rate:	9600
Port:	COM1
Protocol:	Modbus RTU

Accessing the IQ 100 Series Device Profile

1. Click the Profile icon in the Title Bar.



2. You will see the IQ 100 Device Profile screen. The tabs at the top of the screen allow you to navigate between Settings screens. The Buttons at the bottom of the screen allowyou to perform tasks, for example, updating the Device Profile. See the example screen below.

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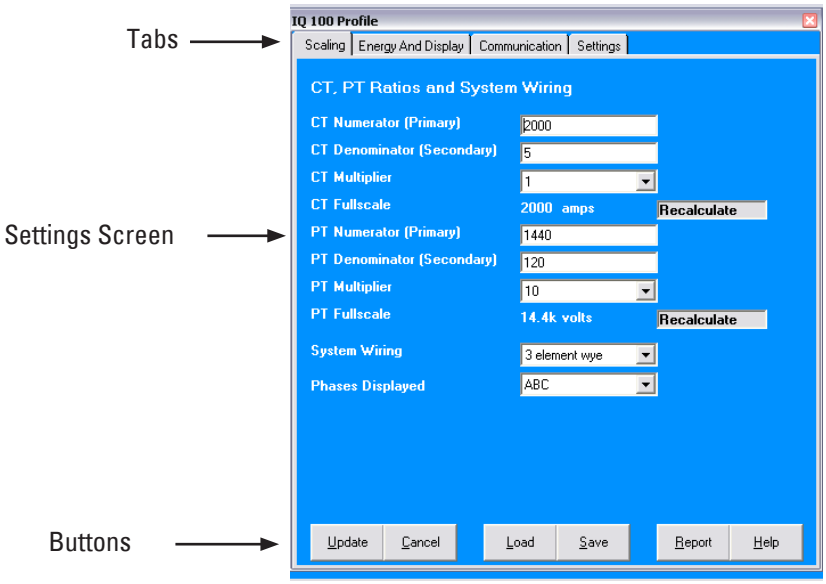


3. To select a setting, click on its tab at the top of the screen. This causes the Settings screen to be displayed. See the following sections for instructions for configuring meter settings.

Performing Device Profile Tasks

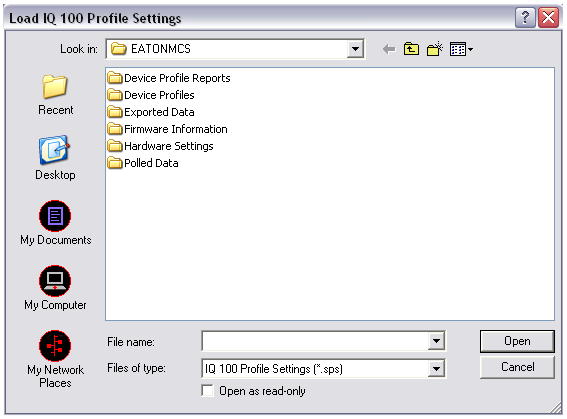
You can perform the following tasks using the Device Profile screen Buttons.

- Update: Click to send the current settings to the meter.

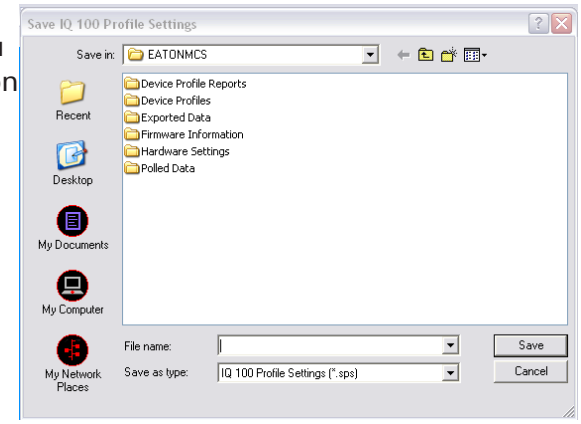
  NOTE: You must click the Update Device button after making changes to the Settings screens, if you want to update the connected meter's settings.

- Cancel: Click to leave the Device Profile Editor without saving any changes.

- Load: Click to load a previously saved Device Profile Settings file. You will see the Load Programmable Settings window, shown on the right.
  Select the saved Device Profile you want and click Open. The settings from that file will now appear in the Settings screens; for example, the CT and PT Ratios will be those from the saved Device Profile, rather than from the currently connected meter.

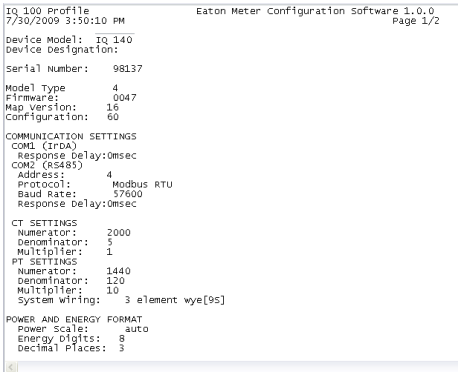


- Save: Click to save the Device Profile settings to a file. You will see the Save Programmable Settings window, shown on the right. Give a name to the Device Profile and click Save.



- Report: Click to open a Notepad window containing the Device Profile settings in a text file. See the example window, shown on the right.
  - Print the text file by selecting File > Print from the Notepad Title Bar.
  - Save the text file by selecting File > Save from the Notepad Title Bar.

  NOTE: When you click Report, you will be given the choice of viewing the Device Profile report or printing the report without viewing it on the screen.



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Configuring Settings

The following sections contain detailed instructions for configuring the Device Profile settings. All of the settings are reached from tabs at the top of the Device Profile screen.

Configuring Scaling

Use this setting to configure Current Transformer and Potential Transformer ratios and to select the Wiring (System Hookup).

Functional Overview of CT and PT Ratios:

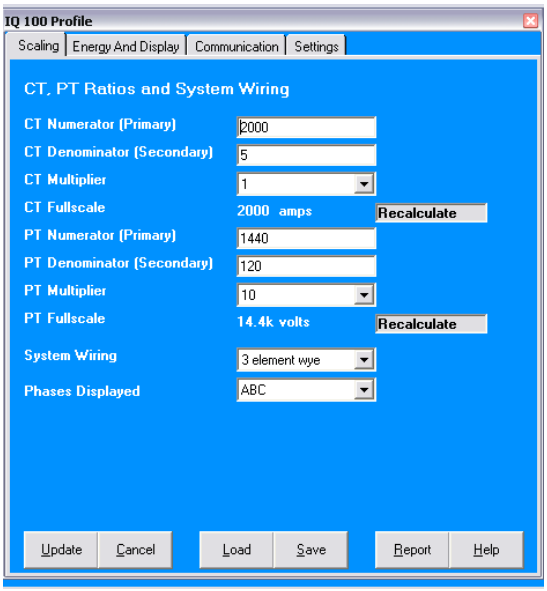
Current and Potential Transformers are used mainly for the following reasons:

- To insulate, and as a result isolate, the meter from high-voltage circuits
- To change the primary voltage and current to standard values and sizes that the meter can measure.

The CT and PT transformers deliver fractions of the primary voltage and current to the meter. With properly set ratios and multipliers, the readings of the meter can be used to determine the energy, voltage, current, or power of the system.

This setting is the first screen displayed when you open the IQ 100 Series Device Profile. If you have been on another screen, click the Scaling tab to re-display this screen. The screen fields and acceptable entries are as follows:

CT Ratios



CT Numerator (Primary): 1 - 9999
CT Denominator (Secondary): 5 or 1 Amp
NOTE: This field is display only.
CT Multiplier (Scaling): 1, 10 or 100
Current Full Scale: Display only.

PT Ratios

PT Numerator (Primary): 1 - 9999
PT Denominator (Secondary): 40 - 600
PT Multiplier (Scaling): 1, 10, 100, or 1000
Voltage Full Scale: Display only.

System Wiring

3 Element Wye; 2.5 Element Wye; 2 CT Delta

Example Settings:

For a CT of 2000/5A, set the following CT Ratios in the entry fields:

CT Numerator (Primary)	2000
CT Denominator (Secondary)	5
CT Multiplier	1

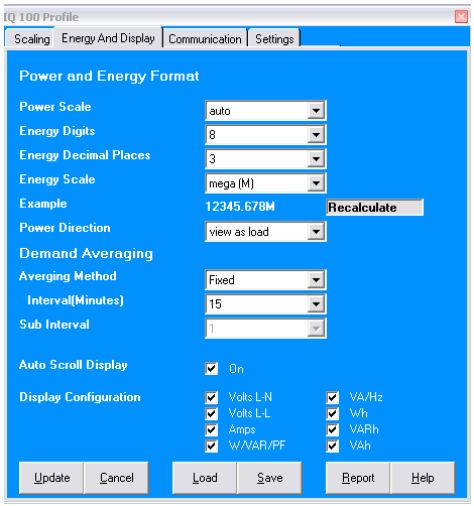
The Current Full Scale field will read 2000.
NOTE: You can obtain the same Current Full Scale by entering a CT Numerator of 200 and a CT Multiplier of 10.

For a system that has 14400V primary with a 120V secondary line to neutral (PT Ratio of 120:1), set the following PT Ratios in the entry fields:

PT Numerator (Primary)	1440
PT Denominator (Secondary)	120
PT Multiplier	10

The Voltage Full Scale field will read 14400.

Configuring Energy and Display Settings



Click the Energy and Display tab. You will see the screen shown on the right. It displays the current settings for Power and Energy Format, Demand Averaging (IQ140 and above), Auto Scrolling and Display Configuration. The screen fields and acceptable entries are as follows:

Power and Energy Format

Power Scale: Unit, kilo (k), Mega (M), Auto
Energy Digits: 5, 6, 7, 8
Decimal Places: 0 - 6
Energy Scale: Unit, kilo (k), Mega (M)
Example: Shows an example of selected settings.
Power Direction: View as Load or View as Generator
NOTES:

- The Energy Digits, Scale and Decimal Places settings determine how the Energy Values are displayed.
- If invalid values are entered, you will see the following warning message: “Warning: Current CT, PT and Energy Settings may cause invalid energy accumulator values.” Once you correct the values and click Recalculate this message goes away.

Demand Averaging (IQ140/150)

Average Method: Fixed or Sliding
Interval: 5, 15, 30 or 60 Minutes
Subinterval: 1, 2, 3 or 4
NOTE: Fixed Average cannot have a Subinterval.

Auto Scroll Display

Clicking the checkbox turns auto-scrolling On and Off. Auto-scrolling controls the display of selected parameters on the meter’s faceplate.

Display Configuration

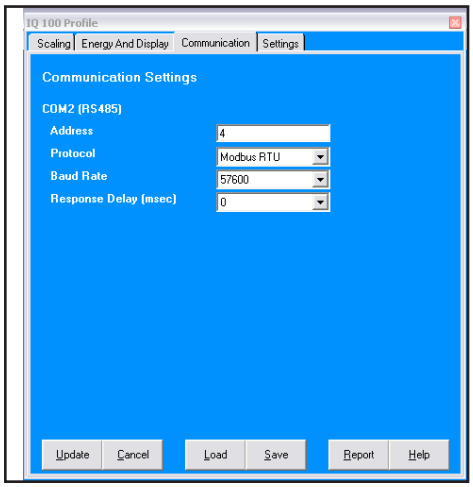
Check the boxes of the Readings you want displayed on the faceplate of the meter. You must select at least one reading.
NOTE: This setting can be ignored for the IQ100 Series transducer, since it doesn’t have a display.

Configuring Communication Settings

Use this setting to configure communication settings for the meter's RS485 Port.

NOTES:
- The settings on this screen are the current settings for communication.
- Any changes may affect communication between the meter and your PC.

Click the Communication tab. You will see the screen shown on the right. The screen fields and acceptable entries are as follows:

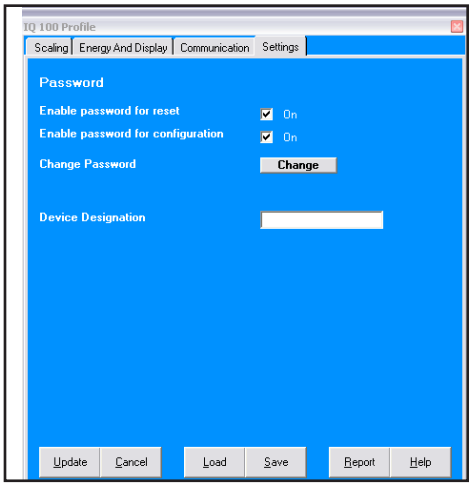


COM 2 (RS485)
Address: 1 - 247
Protocol: Modbus RTU, Modbus ASCII or DNP 3.0
Baud Rate: 9600, 19200, 38400, 57600
Response Delay: 0 - 750 (50 msec increments)
NOTE: Response Delay is the delay the meter should use before responding to queries. If your connecting device requires a delay before receiving information, use response delay to program the time to wait before the meter starts responding to queries.

Configuring (System) Settings

Use this setting to configure meter password or assign a meter designation.

Click the Settings tab. You will see the screen shown on the right.



- To Enable or Disable Password for Reset and/or Configuration: Click the checkbox next to the option. Enabling Password protection prevents unauthorized tampering with devices.

  IMPORTANT! You must set up a password before enabling Password Protection. Click the Change button next to Change Password if you have not already set up a password.

- To Change the Device Designation: input a new designation into this field.

When you click the Change button next to Change Password in the Settings screen, you will see the message window shown on the right.

1. Type in the new password (0 - 9999).

2. Retype the password.

3. Click Change. The new password will be saved and the meter will restart.

4. You can now enable the Password for Reset (Reset Max/Min Energy Settings) or Configuration (Device Profile) by clicking the checkbox next to the option.

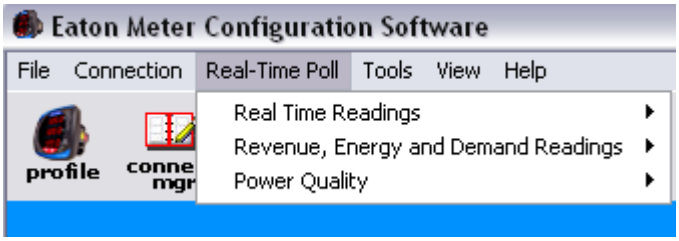
When a user attempts to make a change that is under Password protection, the Eaton Meter configuration software opens a message window asking for the password. If the correct Password is not entered, the change will not take place.

Polling the IQ 100 Series Meter

The Real Time Poll features of Eaton Meter Configuration Software are used to continuously view instantaneous values within an IQ 100 Series meter. The software provides tabular views of metered values, circuit measurements, interval data, and Pulse data.

The Real Time Poll features are divided into three groups, accessed by clicking Real-Time Poll in the Title Bar:

- Real Time Readings
- Revenue, Energy and Demand Readings
- Power Quality

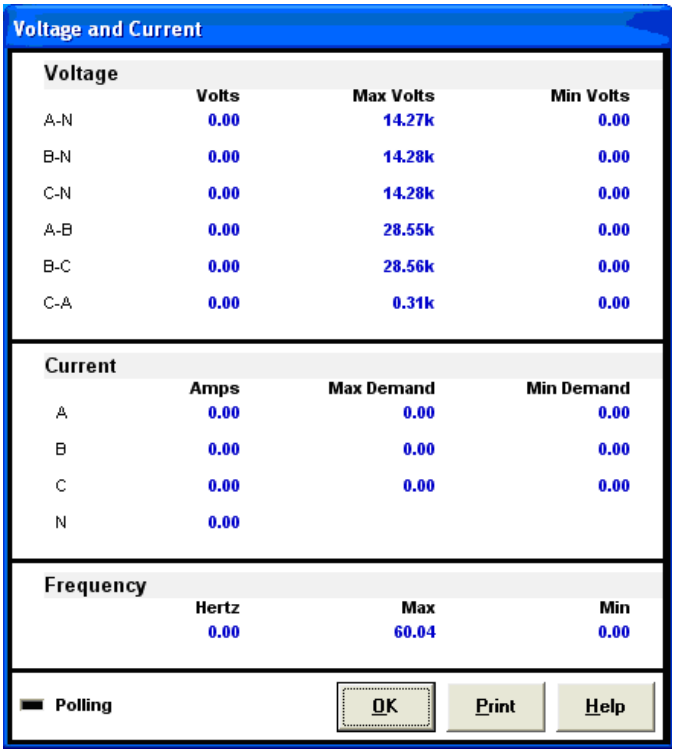


When you click Real Time Readings; Revenue, Energy and Demand Readings; and Power Quality and Alarms, you will see a sub-menu that allows you to select individual polling screens.

NOTE: Clicking the Polling Icon on the Title Bar is the same as selecting Instantaneous Polling from the Real-Time Poll > Real Time Readings menu; clicking the Phasors Icon on the Title Bar is the same as selecting Phasors from the Real-Time Poll > Power Quality and Alarms menu.

Instantaneous Polling

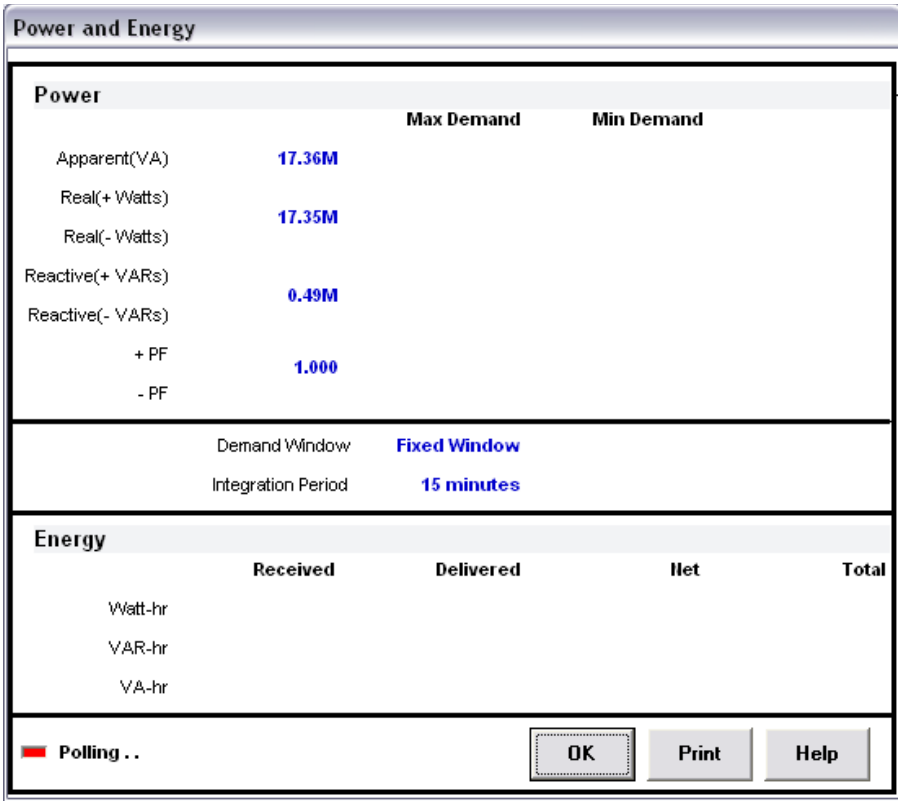
Click Real-Time Poll > Real Time Readings > Instantaneous Polling. You will see the screen shown below.



- Click Print to print a copy of the screen.
- Click Help to view instructions for this screen.
- Click OK to return to the main screen.

Poll Power and Demand

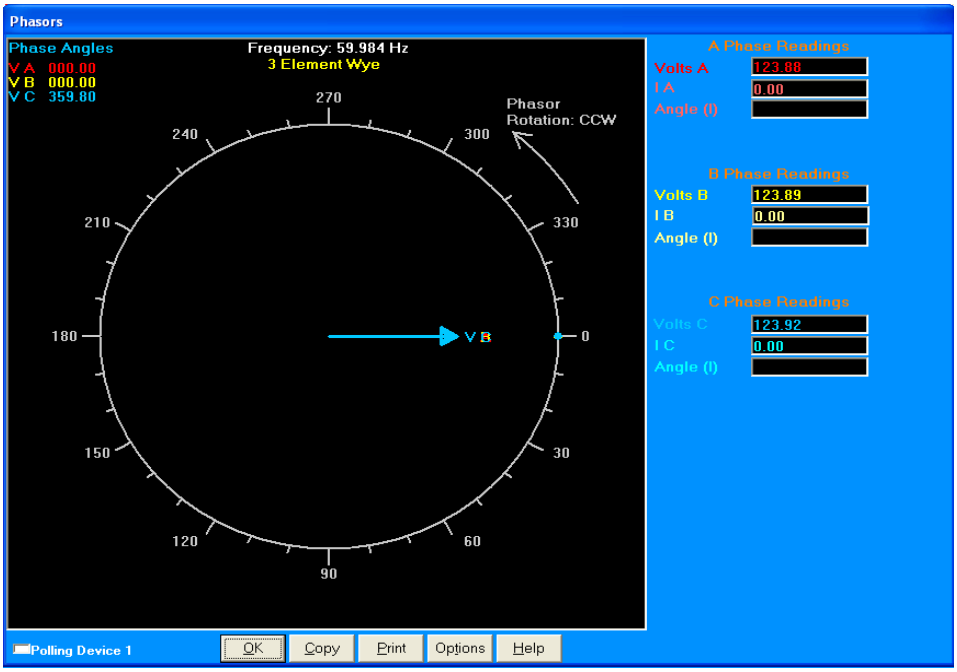
Click Real-Time Poll > Revenue, Energy and Demand Readings > Power and Demand. You will see the screen shown below.



- Click Print to print a copy of the screen.
- Click Help to view instructions for this screen.
- Click OK to return to the main screen.

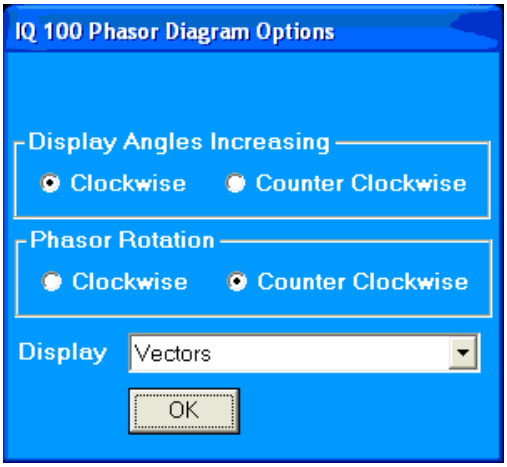
Poll Phasors

Click Real Time Poll > Power Quality and Alarms > Phasors. You will see the screen shown below.



The Phasors screen displays the Phase relationships of the currently connected meter. If you have an auxiliary voltage reading (i.e. generator and bus where the V Aux is the generator), Aux box and the V Aux phaser are displayed. The V Aux phasor is referenced to V A phase.

To adjust the Phasor display, click Options at the bottom of the screen.
You will see the screen shown on the right.



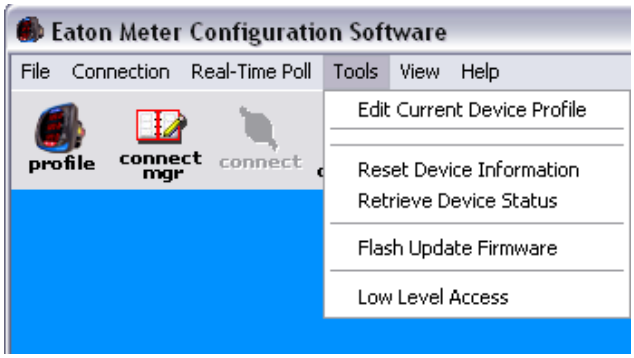
a. In the Display Angles Increasing and Phasor Rotation boxes, select either Clockwise or Counter Clockwise.

b. From the pull-down menu at the bottom of the screen, select Vectors, Triangles or Vectors and Triangles to change the graphic representation of the data.

Click OK to save your selections and return to the Phasors screen.

- Click Copy to save a copy of the screen to the clipboard.
- Click Print to send a copy of the graph to a printer.
- Click Help to view instructions for this screen.
- Click OK to return to the main screen.

Using the IQ 100 Series Tools Menu

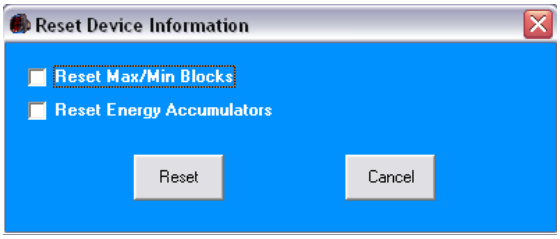


The Tools Menu allows you to access specific functions for the IQ 100 Series Meter. Click Tools from the Title Bar to display the Tools Menu.

Accessing the Device Profile Screen

Click the first option, Edit Current Device Profile, to open the Device Profile screen. This menu option performs the same function as clicking the Profile icon in the Title Bar.

Reset Device Information

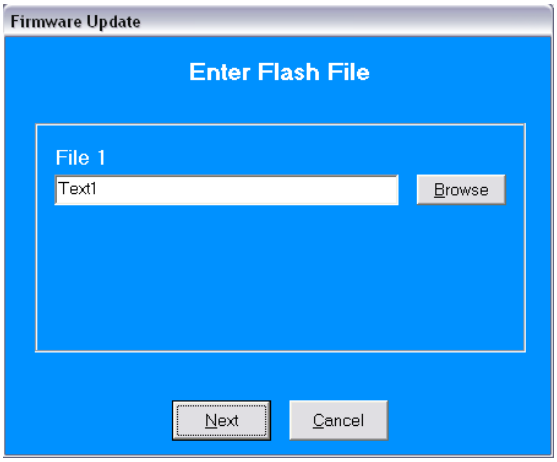


Click this option to reset either Max/Min values (IQ 130, IQ 140, and IQ 150 meters) and/or Energy Accumulators (IQ 150 only). You will see the screen shown on the right. Click the checkbox next to the item(s) you want to reset.

Retrieve Device Status

Click this option to see the Device status screen for the meter. this is the same screen that displays when you first connect to the meter.

Flash Update Firmware



Click this option to upgrade the meter's firmware. You will see the screen on the right.

Click Browse to locate the flash file.

Click OK to update the firmware with the flash file. When flashing is complete, click Exit to close the screen.

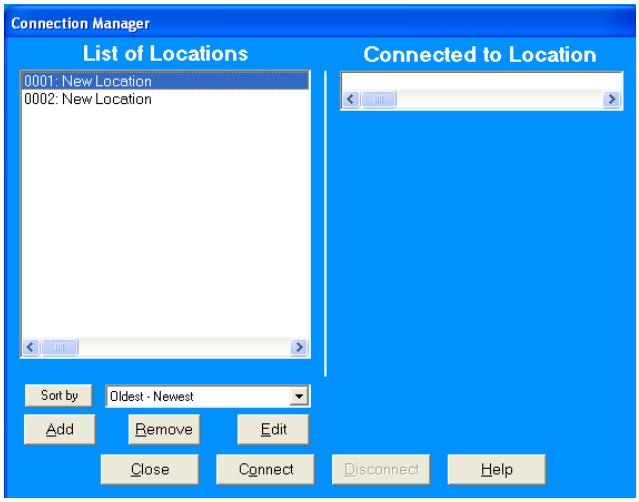
NOTE: Flash updating of firmware can only be done at a Baud Rate of 57.6k.

Performing Additional Tasks with Eaton Meter Configuration Software

The following sections contain instructions for other tasks you can perform using the Eaton Meter Configuration Software.

Using Connection Manager

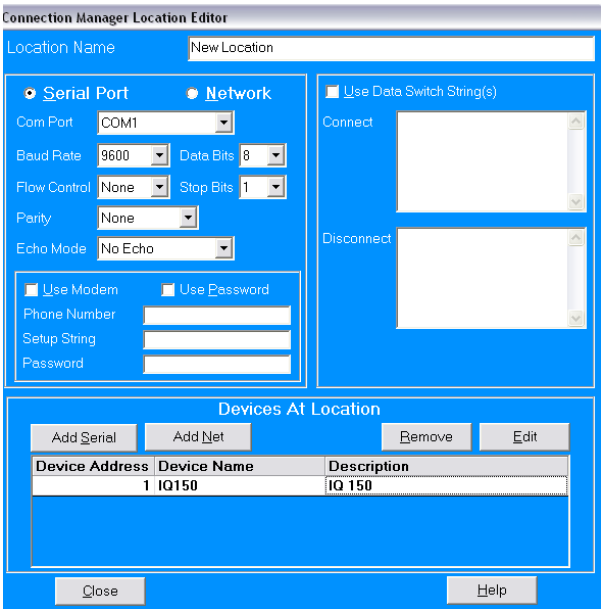
Use Connection Manager to Add or Remove Connection Locations and/or Devices at Locations.



1. Click Connection > Connection Manager or click on the Connect Mgr icon. You will see the screen shown on the right.

List of Locations:

On the left side of the Connection Manager screen is a List of Locations. These are the locations of one or more meters to which you can connect. You can Add a Location and/or a Device; Edit a Location and/or Device; or Remove a Location and/or Device.



- To Add a Location:
  a. Click on the Add button. You will see the Connection Manager Location Editor screen. On this screen, you program the Communication settings for each New Location.
  b. Type a Name for the New Location.
  c. Click Serial Port or Network.
  d. Enter Communications Settings:

Com Port:	COM 1 - 99
Baud Rate:	1200 - 115200
Flow Control:	None or Hardware
Data Bits:	8 (or 7)
Parity:	None (Even, Odd)

  e. To Add a Device:
  - Click Add Serial (to add a Serial Port Connected Device) or Add Net (to add a Network Connected Device) in the Devices at Location box. You can add up to 255 Devices (Serial Port and/or Network connected) at one Location.

NOTES:
- All devices must have the same connection parameters: Baud, Parity and Flow Control.
- Multiple Devices slow down polling.

f. To Edit a Device:
   - Select the Device from the Devices at Location box. (Scroll down to find all devices.)
   - Click Edit. You will see the Connection Manager Location Device Editor screen, shown on the right.
   - Use this screen to program the Device Properties for each device at a Location.
     • If the Device has a Serial Port Device Connection, you will see the first (top) example screen.
     • If the Device has a Network Device Connection, you will see the second example screen.
       Click the Network or Serial button at the top of the screen to switch connection screens.
   - Enter Device Properties:
     Address: 1 - 247 (Unique Address)
     Name: Device Name
     Description: (Type and Number, for example)
     Protocol: Modbus RTU, ASCII, or Modbus TCP
     Device Type: IQ Meter
     Comm Port: 1 or 2 (Serial Port Only)
     IP Address: 100.10.10.10 (for example) (Network Only)
     Port Number: 502 (Default) (Network Only)

   - Click Close to save settings and return to the Connection Manager Location Editor screen.

g. To Remove a Device, select the Device from the Devices at Location box and click Remove.
h. Click Close to return to the Connection Manager screen.

• To Edit a Location:
  a. Select a Location from the List of Locations box.
  b. Click the Edit button. The Connection Manager Location Editor screen appears, displaying the current settings for the location.
  c. Make any changes to settings and/or devices at the location.
  d. Click Close to exit the screen.

• To Remove a Location:
  a. Select a Location from the List of Locations box.
  b. Click Remove.
  c. Click Yes in the Confirmation window.

• To Sort List of Locations:
  a. Select a sort method (A-Z, Z-A, Newest-Oldest or Oldest-Newest) from the pull-down menu.
  b. Click Sort By.

- To Connect to a Location:
  a. Select the Location you want to connect to from the List of Locations box.

  NOTE: You may only connect to one location at a time. To change to a different location, you must disconnect from the current location by selecting it and clicking Disconnect.

  b. Click Connect. When the connection is made, the selected location appears in the Connected To Locations section of the screen.
  c. Click Close. The Device Status screen opens, confirming the connection. The Computer Status Bar at the bottom of the screen also confirms the computer's connection parameters.

NOTE: If the connection fails, a popup screen will alert you. Check that all cables are secure, that the RS232 cable is connected to the correct Com Port on the computer, and that the computer is set to use the same baud rate and protocol as the meter to which the computer is connected.

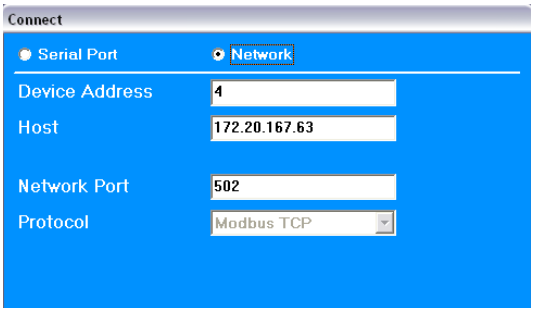
Disconnecting from an IQ 100 Series meter

To disconnect from an IQ 100 Series meter or from a location, do one of the following:

- Click on the Disconnect icon in the Title Bar.
- Select Connection > Disconnect from the Title Bar.
- From the Connection Manager screen, select the location from the Connected to Location field and click the Disconnect button.

Changing the Primary Device/Address

Use this feature to select another meter as the primary device.



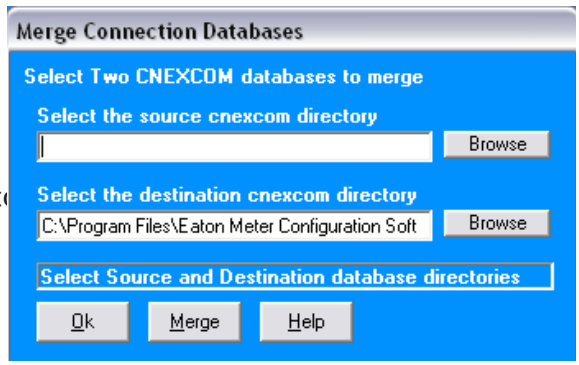
1. Click Connect > Change Primary Device/Address. You will see the screen on the right.

2. Enter the address of the device you want to designate as the new Primary Device.

3. Click OK.

Merging Connection Databases

Use this feature to combine two sets of cnexcom databases.



1. Click Connection > Merge Connection Databases. You will see the screen on the right. It allows you to select the two databases to merge.

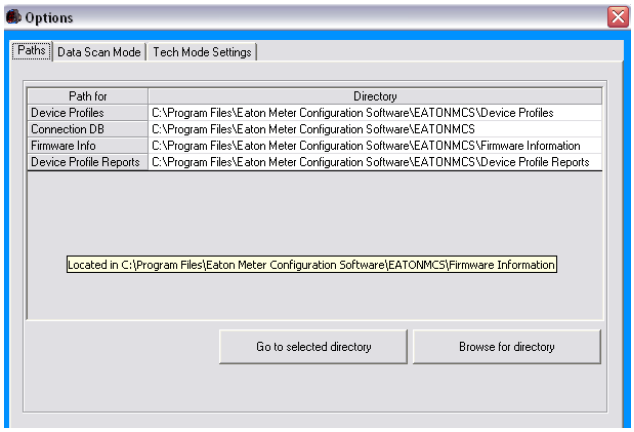
2. Click the Browse button next to each field to pick the databases. The Source cnexcom database will be merged int Destination cnexcom database.

3. Click the Merge button to proceed with the merge; click OK to exit the screen.

Using the Options Screen

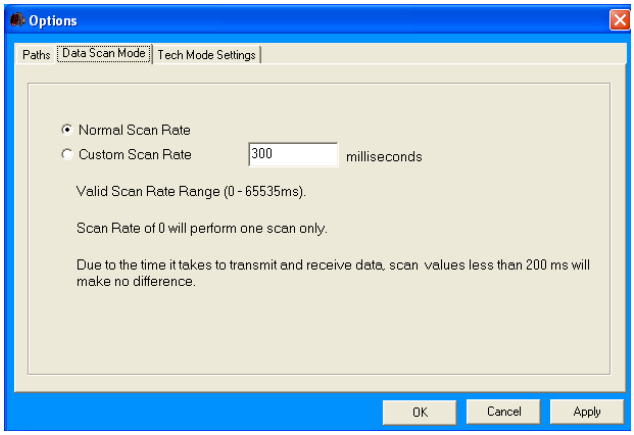
1. Click View > Options. You will see the screen shown on the right. Use this screen to access the following features:
   - Paths for Eaton Meter Configuration Software files
   - Data Scan Mode

   Use the tabs at the top of the screen to access these features.



2. The first Options screen is the Paths screen, shown on the right. Use this screen to view or change the paths the Eaton Meter Configuration Software uses for data.

3. Click the Data Scan Mode tab to see the second screen on the right. Use this screen to select Normal Scan rate or to enter a custom Scan rate.


Options
Paths
Data Scan Mode
Tech Mode Settings
Normal Scan Rate
Custom Scan Rate
300
milliseconds
Valid Scan Rate Range (0 - 65535ms).
Scan Rate of 0 will perform one scan only.
Due to the time it takes to transmit and receive data, scan values less than 200 ms will make no difference.
OK
Cancel
Apply

4. Click:
   - Apply to apply your selection(s) and keep the Options screen open.
   - Okay to apply your selection and close the Options screen.
   - Cancel to close the Options screen without saving any selections that have not been applied (using the Apply button).

Using the Help Menu

The Help menu, accessed by clicking Help in the Title Bar, allows you to:

- View this manual online: click Help > User Manual.
- View information about the Eaton Meter Configuration Software, including version number: click Help > About Eaton Meter Configuration Software.

App. A: IQ 100 Series Navigation Maps

Introduction

You can configure the IQ 100 Series meter and perform related tasks using the buttons on the meter face. This appendix contains the Navigation maps for the IQ 100 Series meter's displays.

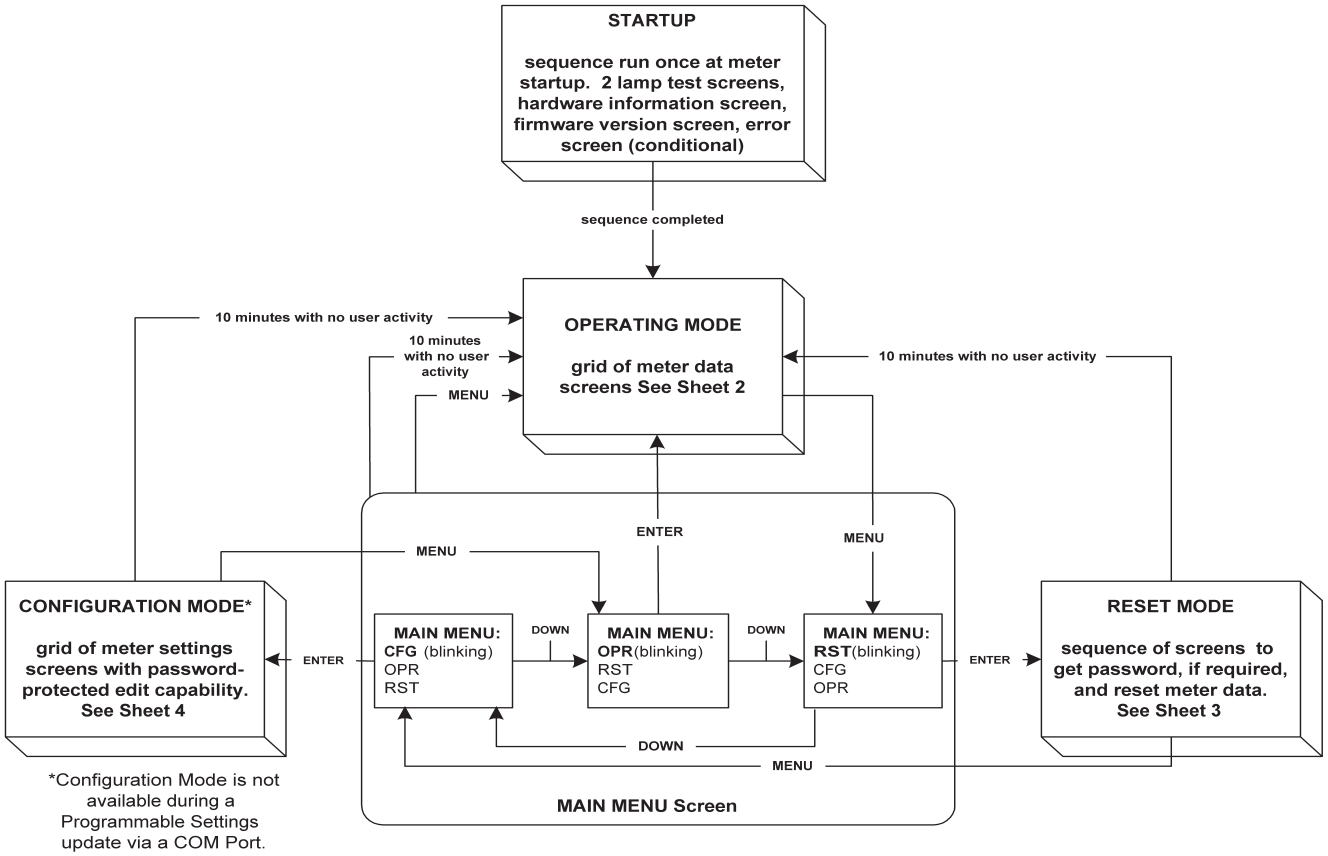
Navigation Maps (Sheets 1 to 4)

The IQ 100 Series Navigation maps begin on the next page. The maps show in detail how to move from one screen to another and from one Display mode to another using the buttons on the face of the meter. All Display Modes will automatically return to Operating mode after 10 minutes with no user activity.

Navigation Map Titles:

- Main Menu Screens (Sheet 1)
- Operating Mode Screens (Sheet 2)
- Reset Mode Screens (Sheet 3)
- Configuration Mode Screens (Sheet 4)

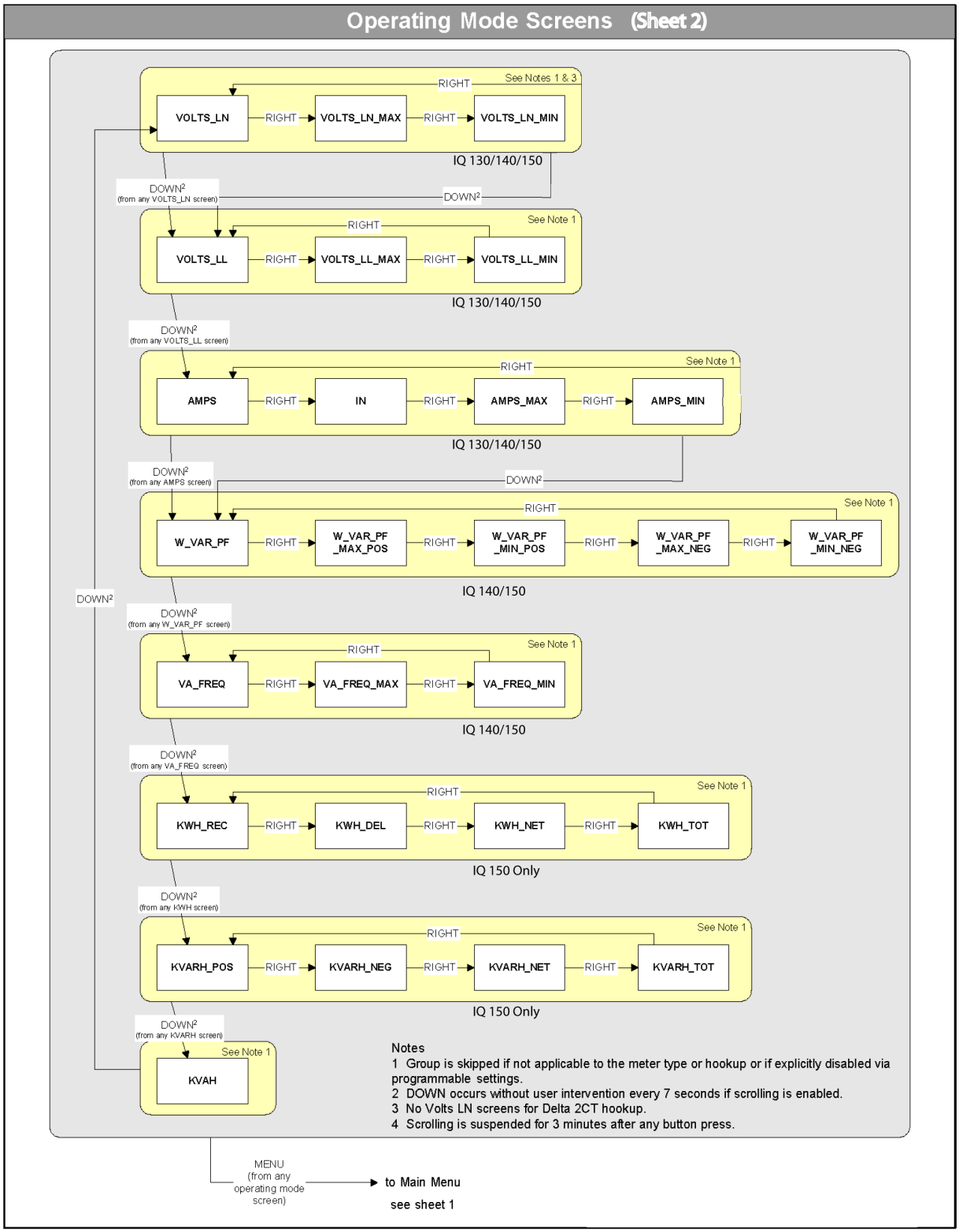
Main Menu Screens (Sheet 1)



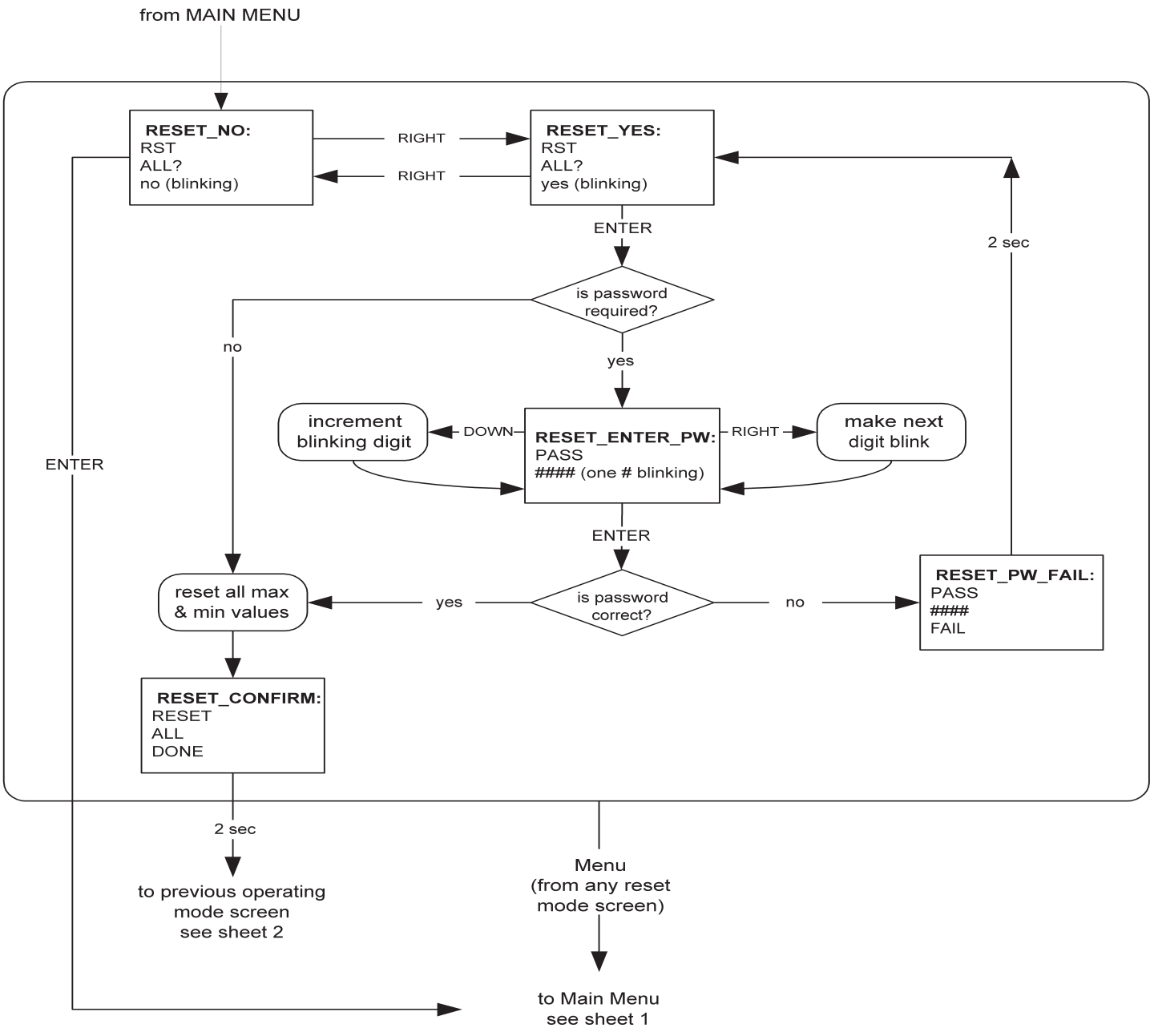
MAIN MENU screen scrolls through 3 choices, showing all 3 at once. The top choice is always the "active" one, which is indicated by the blinking legend.

BUTTONS	
MENU	**Returns to previous menu from any screen in any mode.**
ENTER	**Indicates acceptance of the current screen and advances to the next one.**
DOWN, RIGHT	**Navigation and Edit buttons**
Navigation:	**No digits or legends are blinking. On a menu, DOWN advances to the next menu selection, RIGHT does nothing. In a grid of screens, DOWN advances to the next row, RIGHT advances to the next column. Rows, columns and menus all navigate circularly.**
Editing:	**A digit or legend is blinking to indicate that it is eligible for change. When a digit is blinking, DOWN increases the digit value, RIGHT moves to the next digit. When a legend is blinking, either button advances to the next choice legend.**

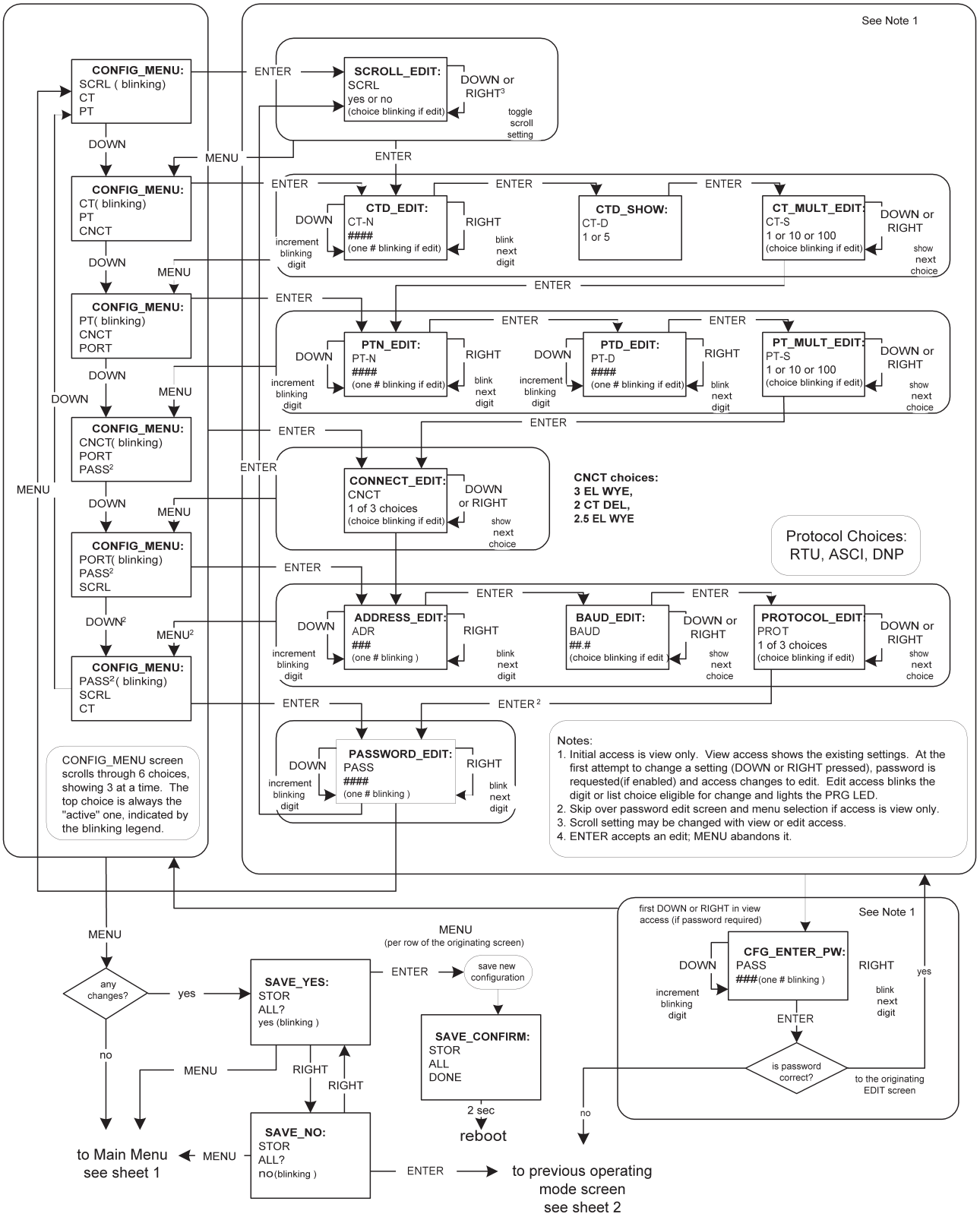
Operating Mode Screens (Sheet 2)



Reset Mode Screens (Sheet 3)



Configuration Mode Screens (Sheet 4)



App.B Modbus Mapping for IQ 100 Series

Introduction

The Modbus Map for the IQ 100 Series meter gives details and information about the possible readings of the meter and its programming.

Modbus Register Map Sections

The IQ 100 Series Modbus Register Map includes the following sections:

Fixed Data Section, Registers 1- 47, details the meter's Fixed Information.

Meter Data Section, Registers 1000 - 12031, details the meter's readings, including Primary readings, Energy Block, Demand Block (IQ 140/150 meter), Phase Angle Block, Status Block, and Minimum and Maximum readings.

Commands Section, Registers 20000 - 26011, details the Meter's Resets Block, Programming Block, Other Commands Block and Encryption Block.

Programmable Settings Section, Registers 30000 - 33575, details all the setups you can program to configure your meter.

Secondary Readings Section, Registers 40001 - 40100, details the Meter's Secondary readings.

Data Formats

ASCII:	ASCII characters packed 2 per register in high, low order and without any termination characters.
SINT16/UINT16:	16-bit signed/unsigned integer.
SINT32/UINT32:	32-bit signed/unsigned integer spanning 2 registers. The lower-addressed register is the high order half.
FLOAT:	32-bit IEEE floating point number spanning 2 registers. The lower-addressed register is the high order half (i.e., contains the exponent).

Floating Point Values

Floating Point Values are represented in the following format:

Register	0								1							
Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Meaning	s	e	e	e	e	e	e	e	m	m	m	m	m	m	m	m
	sign	exponent							mantissa							

Register	0								1							
Byte	0								1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Meaning	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
	mantissa															

The formula to interpret a Floating Point Value is: $-1^{sign} \times 2^{exponent-127} \times 1.mantissa$ = 0x0C4E11DB9

$-1^{sign} \times 2^{137-127} \times 1 \bullet 10000100011101101110 01$

$-1 \times 2^{10} \times 1.75871956$

-1800.929

Register	0x0C4E1								0x01DB9							
Byte	0x0C4								0x0E1							
Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Meaning	s	e	e	e	e	e	e	e	m	m	m	m	m	m	m	m
	sign	exponent							mantissa							
	1	0x089 + 137							0b01100001000111011011 1001							

Register	0x01DB9							
Byte	0x01D							
Bit	7	6	5	4	3	2	1	0
Meaning	m	m	m	m	m	m	m	m
	mantissa							

Formula Explanation:

C4E11DB9 (hex) 11000100 11100001 00011101 10111001 (binary)

The sign of the mantissa (and therefore the number) is 1, which represents a negative value.

The Exponent is 10001001 (binary) or 137 decimal.
The Exponent is a value in excess 127. So, the Exponent value is 10.

The Mantissa is 11000010001110110111001 binary.
With the implied leading 1, the Mantissa is (1).C23B72 (hex).

The Floating Point Representation is therefore -1.75871956 times 2 to the 10.

Decimal equivalent: -1800.929

NOTES:
- Exponent = the whole number before the decimal point.
- Mantissa = the positive fraction after the decimal point.

Important Note Concerning the IQ 100 Series Modbus Map

In depicting Modbus Registers (Addresses), the IQ 100 Series meter's Modbus map uses Holding Registers only.

Hex Representation

The representation shown in the table below is used by developers of Modbus drivers and libraries, SEL 2020/2030 programmers and Firmware Developers. The meter's Modbus map also uses this representation.

Hex Description
0008 – 000F Meter Serial Number

Decimal Representation

The meter's Modbus map defines Holding Registers as (4X) registers. Many popular SCADA and HMI packages and their Modbus drivers have user interfaces that require users to enter these Registers starting at 40001. So instead of entering two separate values, one for register type and one for the actual register, they have been combined into one number.

The meter's Modbus map uses a shorthand version to depict the decimal fields -i.e., not all of the digits required for entry into the SCADA package UI are shown.

For example:

You need to display the meter's serial number in your SCADA application. The meter's Modbus map shows the following information for meter serial number:

Decimal	Description
9 – 16	Meter Serial Number

In order to retrieve the meter's serial number, enter 40009 into the SCADA UI as the starting register, and 8 as the number of registers.

- In order to work with SCADA and Driver packages that use the 40001 to 49999 method for requesting holding registers, take 40000 and add the value of the register (Address) in the decimal column of the Modbus Map. Then enter the number (e.g., 4009) into the UI as the starting register.
- For SCADA and Driver packages that use the 400001 to 465536 method for requesting holding registers take 400000 and add the value of the register (Address) in the decimal column of the Modbus Map. Then enter the number (e.g., 400009) into the UI as the starting register. The drivers for these packages strip off the leading four and subtract 1 from the remaining value. This final value is used as the starting register or register to be included when building the actual modbus message.

Modbus Register Map (MM-1 to MM-16)

The IQ 100 Series Modbus Register Map begins on the following page.

Modbus Address Hex	Modbus Address Decimal	Description[1]	Format	Range[6]	Units or Resolution	Comments	# Reg
Fixed Data Section							
Identification Block						read-only	
0000 - 0007	1 - 8	Reserved			none		8
0008 - 000F	9 - 16	Meter Serial Number	ASCII	16 char	none		8
0010 - 0010	17 - 17	Meter Type	UINT16	bit-mapped	-------t --------	t = transducer model (1=yes, 0=no)	1
0011 - 0012	18 - 19	Firmware Version	ASCII	4 char	none		2
0013 - 0013	20 - 20	Map Version	UINT16	0 to 65535	none		1
0014 - 0014	21 - 21	Meter Configuration	UINT16	bit-mapped	-------- --ffffff	ffffff = calibration frequency (50 or 60)	1
0015 - 0015	22 - 22	ASIC Version	UINT16	0-65535	none		1
0016 - 0026	23 - 39	Reserved					17
0027 - 002E	40 - 47	Meter Name	ASCII	16 char	none		8
						Block Size:	47
Meter Data Section[2]							
Primary Readings Block, 6 cycles (IEEE Floating Point						read-only	
0383 - 0384	900 - 901	Watts, 3-Ph total	FLOAT	-9999 M to +9999 M	watts		2
0385 - 0386	902 - 903	VARs, 3-Ph total	FLOAT	-9999 M to +9999 M	VARs		2
0387 - 0388	904 - 905	VAs, 3-Ph total	FLOAT	-9999 M to +9999 M	VAs		2
						Block Size:	6
Primary Readings Block, 60 cycles (IEEE Floating Point)						read-only	
03E7 - 03E8	1000 - 1001	Volts A-N	FLOAT	0 to 9999 M	volts		2
03E9 - 03EA	1002 - 1003	Volts B-N	FLOAT	0 to 9999 M	volts		2
03EB - 03EC	1004 - 1005	Volts C-N	FLOAT	0 to 9999 M	volts		2
03ED - 03EE	1006 - 1007	Volts A-B	FLOAT	0 to 9999 M	volts		2
03EF - 03F0	1008 - 1009	Volts B-C	FLOAT	0 to 9999 M	volts		2
03F1 - 03F2	1010 - 1011	Volts C-A	FLOAT	0 to 9999 M	volts		2
03F3 - 03F4	1012 - 1013	Amps A	FLOAT	0 to 9999 M	amps		2
03F5 - 03F6	1014 - 1015	Amps B	FLOAT	0 to 9999 M	amps		2
03F7 - 03F8	1016 - 1017	Amps C	FLOAT	0 to 9999 M	amps		2
03F9 - 03FA	1018 - 1019	Watts, 3-Ph total	FLOAT	-9999 M to +9999 M	watts		2
03FB - 03FC	1020 - 1021	VARs, 3-Ph total	FLOAT	-9999 M to +9999 M	VARs		2
03FD - 03FE	1022 - 1023	VAs, 3-Ph total	FLOAT	-9999 M to +9999 M	VAs		2
03FF - 0400	1024 - 1025	Power Factor, 3-Ph total	FLOAT	-1.00 to +1.00	none		2
0401 - 0402	1026 - 1027	Frequency	FLOAT	0 to 65.00	Hz		2
0403 - 0404	1028 - 1029	Neutral Current	FLOAT	0 to 9999 M	amps		2
						Block Size:	30

Modbus Address							
Hex	Decimal	Description[1]	Format	Range[6]	Units or Resolution	Comments	# Reg
Primary Energy Block						read-only	
044B - 044C	1100 - 1101	W-hours, Received	SINT32	0 to 99999999 or 0 to -99999999	Wh per energy format	* Wh received & delivered always have opposite signs	2
044D - 044E	1102 - 1103	W-hours, Delivered	SINT32	0 to 99999999 or 0 to -99999999	Wh per energy format	* Wh received is positive for "view as load", delivered is positive for "view as generator"	2
044F - 0450	1104 - 1105	W-hours, Net	SINT32	-99999999 to 99999999	Wh per energy format		2
0451 - 0452	1106 - 1107	W-hours, Total	SINT32	0 to 99999999	Wh per energy format	* 5 to 8 digits	2
0453 - 0454	1108 - 1109	VAR-hours, Positive	SINT32	0 to 99999999	VARh per energy format	* decimal point implied, per energy format	2
0455 - 0456	1110 - 1111	VAR-hours, Negative	SINT32	0 to -99999999	VARh per energy format	* resolution of digit before decimal point =	2
0457 - 0458	1112 - 1113	VAR-hours, Net	SINT32	-99999999 to 99999999	VARh per energy format	units, kilo, or mega, per energy format	2
0459 - 045A	1114 - 1115	VAR-hours, Total	SINT32	0 to 99999999	VARh per energy format		2
045B - 045C	1116 - 1117	VA-hours, Total	SINT32	0 to 99999999	VAh per energy format	* see note 10	2
						Block Size:	18
Primary Demand Block (IEEE Floating Point)						read-only	
07CF - 07D0	2000 - 2001	Amps A, Average	FLOAT	0 to 9999 M	amps		2
07D1 - 07D2	2002 - 2003	Amps B, Average	FLOAT	0 to 9999 M	amps		2
07D3 - 07D4	2004 - 2005	Amps C, Average	FLOAT	0 to 9999 M	amps		2
07D5 - 07D6	2006 - 2007	Positive Watts, 3-Ph, Average	FLOAT	-9999 M to +9999 M	watts		2
07D7 - 07D8	2008 - 2009	Positive VARs, 3-Ph, Average	FLOAT	-9999 M to +9999 M	VARs		2
07D9 - 07DA	2010 - 2011	Negative Watts, 3-Ph, Average	FLOAT	-9999 M to +9999 M	watts		2
07DB - 07DC	2012 - 2013	Negative VARs, 3-Ph, Average	FLOAT	-9999 M to +9999 M	VARs		2
07DD - 07DE	2014 - 2015	VAs, 3-Ph, Average	FLOAT	-9999 M to +9999 M	VAs		2
07DF - 07E0	2016 - 2017	Positive PF, 3-Ph, Average	FLOAT	-1.00 to +1.00	none		2
07E1 - 07E2	2018 - 2019	Negative PF, 3-PF, Average	FLOAT	-1.00 to +1.00	none		2
						Block Size:	20
Primary Minimum Block (IEEE Floating Point)						read-only	
0BB7 - 0BB8	3000 - 3001	Volts A-N, Minimum	FLOAT	0 to 9999 M	volts		2
0BB9 - 0BBA	3002 - 3003	Volts B-N, Minimum	FLOAT	0 to 9999 M	volts		2
0BBB - 0BBC	3004 - 3005	Volts C-N, Minimum	FLOAT	0 to 9999 M	volts		2
0BBD - 0BBE	3006 - 3007	Volts A-B, Minimum	FLOAT	0 to 9999 M	volts		2
0BBF - 0BC0	3008 - 3009	Volts B-C, Minimum	FLOAT	0 to 9999 M	volts		2
0BC1 - 0BC2	3010 - 3011	Volts C-A, Minimum	FLOAT	0 to 9999 M	volts		2
0BC3 - 0BC4	3012 - 3013	Amps A, Minimum Avg Demand	FLOAT	0 to 9999 M	amps		2
0BC5 - 0BC6	3014 - 3015	Amps B, Minimum Avg Demand	FLOAT	0 to 9999 M	amps		2
0BC7 - 0BC8	3016 - 3017	Amps C, Minimum Avg Demand	FLOAT	0 to 9999 M	amps		2
0BC9 - 0BCA	3018 - 3019	Positive Watts, 3-Ph, Minimum Avg Demand	FLOAT	0 to +9999 M	watts		2
0BCB - 0BCC	3020 - 3021	Positive VARs, 3-Ph, Minimum Avg Demand	FLOAT	0 to +9999 M	VARs		2

Modbus Address							
Hex	Decimal	Description[1]	Format	Range[6]	Units or Resolution	Comments	# Reg
0BCD - 0BCE	3022 - 3023	Negative Watts, 3-Ph, Minimum Avg Demand	FLOAT	0 to +9999 M	watts		2
0BCF - 0BD0	3024 - 3025	Negative VARs, 3-Ph, Minimum Avg Demand	FLOAT	0 to +9999 M	VARs		2
0BD1 - 0BD2	3026 - 3027	VAs, 3-Ph, Minimum Avg Demand	FLOAT	-9999 M to +9999 M	VAs		2
0BD3 - 0BD4	3028 - 3029	Positive Power Factor, 3-Ph, Minimum Avg Demand	FLOAT	-1.00 to +1.00	none		2
0BD5 - 0BD6	3030 - 3031	Negative Power Factor, 3-Ph, Minimum Avg Demand	FLOAT	-1.00 to +1.00	none		2
0BD7 - 0BD8	3032 - 3033	Frequency, Minimum	FLOAT	0 to 65.00	Hz		2
						Block Size:	34
Primary Maximum Block (IEEE Floating Point)						read-only	
0C1B - 0C1C	3100 - 3101	Volts A-N, Maximum	FLOAT	0 to 9999 M	volts		2
0C1D - 0C1E	3102 - 3103	Volts B-N, Maximum	FLOAT	0 to 9999 M	volts		2
0C1F - 0C20	3104 - 3105	Volts C-N, Maximum	FLOAT	0 to 9999 M	volts		2
0C21 - 0C22	3106 - 3107	Volts A-B, Maximum	FLOAT	0 to 9999 M	volts		2
0C23 - 0C24	3108 - 3109	Volts B-C, Maximum	FLOAT	0 to 9999 M	volts		2
0C25 - 0C26	3110 - 3111	Volts C-A, Maximum	FLOAT	0 to 9999 M	volts		2
0C27 - 0C28	3112 - 3113	Amps A, Maximum Avg Demand	FLOAT	0 to 9999 M	amps		2
0C29 - 0C2A	3114 - 3115	Amps B, Maximum Avg Demand	FLOAT	0 to 9999 M	amps		2
0C2B - 0C2C	3116 - 3117	Amps C, Maximum Avg Demand	FLOAT	0 to 9999 M	amps		2
0C2D - 0C2E	3118 - 3119	Positive Watts, 3-Ph, Maximum Avg Demand	FLOAT	0 to +9999 M	watts		2
0C2F - 0C30	3120 - 3121	Positive VARs, 3-Ph, Maximum Avg Demand	FLOAT	0 to +9999 M	VARs		2
0C31 - 0C32	3122 - 3123	Negative Watts, 3-Ph, Maximum Avg Demand	FLOAT	0 to +9999 M	watts		2
0C33 - 0C34	3124 - 3125	Negative VARs, 3-Ph, Maximum Avg Demand	FLOAT	0 to +9999 M	VARs		2
0C35 - 0C36	3126 - 3127	VAs, 3-Ph, Maximum Avg Demand	FLOAT	-9999 M to +9999 M	VAs		2
0C37 - 0C38	3128 - 3129	Positive Power Factor, 3-Ph, Maximum Avg Demand	FLOAT	-1.00 to +1.00	none		2
0C39 - 0C3A	3130 - 3131	Negative Power Factor, 3-Ph, Maximum Avg Demand	FLOAT	-1.00 to +1.00	none		2
0C3B - 0C3C	3132 - 3133	Frequency, Maximum	FLOAT	0 to 65.00	Hz		2
						Block Size:	34
Reserved Block[7, 13]						read-only	
0F9F - 0F9F	4000 - 4000	Reserved	UINT16	0 to 9999, or 65535	0.1%		1
0FA0 - 0FA0	4001 - 4001	Reserved	UINT16	0 to 9999, or 65535	0.1%		1
0FA1 - 0FA1	4002 - 4002	Reserved	UINT16	0 to 9999, or 65535	0.1%		1
0FA2 - 0FA2	4003 - 4003	Reserved	UINT16	0 to 9999, or 65535	0.1%		1
0FA3 - 0FA3	4004 - 4004	Reserved					1
0FA4 - 0FA4	4005 - 4005	Reserved					1
0FA5 - 0FA5	4006 - 4006	Reserved					1
0FA6 - 0FA6	4007 - 4007	Reserved					1
0FA7 - 0FA7	4008 - 4008	Reserved					1
0FA8 - 0FA8	4009 - 4009	Reserved					1

Modbus Address							
Hex	Decimal	Description[1]	Format	Range[6]	Units or Resolution	Comments	# Reg
0FA9 - 0FA9	4010 - 4010	Reserved					1
0FAA - 0FAA	4011 - 4011	Reserved					1
0FAB - 0FAB	4012 - 4012	Reserved					1
0FAC - 0FAC	4013 - 4013	Reserved					1
0FAD - 0FAD	4014 - 4014	Reserved					1
0FAE - 0FAE	4015 - 4015	Reserved					1
0FAF - 0FAF	4016 - 4016	Reserved					1
0FB0 - 0FB0	4017 - 4017	Reserved					1
0FB1 - 0FB8	4018 - 4025	Reserved					8
0FB9 - 0FBC	4026 - 4029	Reserved					4
0FBD - 0FC4	4030 - 4037	Reserved					8
0FC5 - 0FC8	4038 - 4041	Reserved					4
						Block Size:	42
Phase Angle Block[14]						**read-only**	
1003 - 1003	4100 - 4100	Phase A Current	SINT16	-1800 to +1800	0.1 degree		1
1004 - 1004	4101 - 4101	Phase B Current	SINT16	-1800 to +1800	0.1 degree		1
1005 - 1005	4102 - 4102	Phase C Current	SINT16	-1800 to +1800	0.1 degree		1
1006 - 1006	4103 - 4103	Angle, Volts A-B	SINT16	-1800 to +1800	0.1 degree		1
1007 - 1007	4104 - 4104	Angle, Volts B-C	SINT16	-1800 to +1800	0.1 degree		1
1008 - 1008	4105 - 4105	Angle, Volts C-A	SINT16	-1800 to +1800	0.1 degree		1
						Block Size:	6
Status Block						**read-only**	
1387 - 1387	5000 - 5000	Meter Status	UINT16	bit-mapped	--exnpch ssssssss	exnpch = EEPROM block OK flags (e=energy, x=max, n=min, p=programmabl settings, c=calibration, h=header), ssssssss = state (1=Run, 2=Limp, 10=Prog Set Update via buttons, 12=Prog Set Update via COM2)	1
1388 - 1388	5001 - 5001	Reserved					1
1389 - 138A	5002 - 5003	Time Since Reset	UINT32	0 to 4294967294	4 msec	wraps around after max coun	2
						Block Size:	4
Commands Section[4]							
Resets Block[9]						**write-only**	
4E1F - 4E1F	20000 - 20000	Reset Max/Min Blocks	UINT16	password[5]			1
4E20 - 4E20	20001 - 20001	Reset Energy Accumulators	UINT16	password[5]			1

Modbus Address Hex	Modbus Address Decimal	Description[1]	Format	Range[6]	Units or Resolution	Comments	# Reg
						Block Size:	2
Meter Programming Block						read/conditional write	
55EF - 55EF	22000 - 22000	Initiate Programmable Settings Update	UINT16	password[5]		meter enters PS update mode	1
55F0 - 55F0	22001 - 22001	Terminate Programmable Settings Update[3]	UINT16	any value		meter leaves PS update mode via reset	1
55F1 - 55F1	22002 - 22002	Calculate Programmable Settings Checksum[3]	UINT16			meter calculates checksum on RAM copy of PS block	1
55F2 - 55F2	22003 - 22003	Programmable Settings Checksum[3]	UINT16			read/write checksum register; PS block saved in EEPROM on write[8]	1
55F3 - 55F3	22004 - 22004	Write New Password[3]	UINT16	0000 to 9999		write-only register; always reads zero	1
59D7 - 59D7	23000 - 23000	Initiate Meter Firmware Reprogramming	UINT16	password[5]			1
						Block Size:	6
Other Commands Block						read/write	
61A7 - 61A7	25000 - 25000	Force Meter Restart	UINT16	password[5]		causes a watchdog reset, always reads 0	1
						Block Size:	1
Encryption Block						read/write	
658F - 659A	26000 - 26011	Perform a Secure Operation	UINT16			encrypted command to read password or change meter type	12
						Block Size:	12
Programmable Settings Section (see Note 15)							
Basic Setups Block						write only in PS update mode	
752F - 752F	30000 - 30000	CT multiplier & denominator	UINT16	bit-mapped	dddddddd mmmmmmmm	high byte is denominator (1 or 5, read-only), low byte is multiplier (1, 10, or 100)	1
7530 - 7530	30001 - 30001	CT numerator	UINT16	1 to 9999	none		1
7531 - 7531	30002 - 30002	PT numerator	UINT16	1 to 9999	none		1
7532 - 7532	30003 - 30003	PT denominator	UINT16	1 to 9999	none		1
7533 - 7533	30004 - 30004	PT multiplier & hookup	UINT16	bit-mapped	mmmmmmmm MMMMhhhh	MMMMmmmmmmmm is PT multiplier (1, 10, 100, 1000), hhhh is hookup enumeration (0 = 3 element wye[9S], 1 = delta 2 CTs[5S], 3 = 2.5 element wye[6S])	1

Modbus Address		Description[1]	Format	Range[6]	Units or Resolution	Comments	# Reg
Hex	Decimal						
7534 - 7534	30005 - 30005	Averaging Method	UINT16	bit-mapped	--iiiiii b----sss	iiiiii = interval (5,15,30,60) b = 0-block or 1-rolling sss = # subintervals (1,2,3,4)	1
7535 - 7535	30006 - 30006	Power & Energy Format	UINT16	bit-mapped	pppp--nn -eee-ddd	pppp = power scale (0-unit, 3-kilo, 6-mega, 8-auto) nn = number of energy digits (5-8 --> 0-3) eee = energy scale (0-unit, 3-kilo, 6-mega) ddd = energy digits after decimal point (0-6) See note 10.	1
7536 - 7536	30007 - 30007	Operating Mode Screen Enables	UINT16	bit-mapped	00000000 eeeeeeee	eeeeeeee = op mode screen rows on(1) or off(0), rows top to bottom are bits low order to high order	1
7537 - 753D	30008 - 30014	Reserved					7
753E - 753E	30015 - 30015	User Settings Flags	UINT16	bit-mapped	---g--nn srp--wf-	g = enable alternate full scale bargraph current (1=on, 0=off) nn = number of phases for voltage & current screens (3=ABC, 2=AB, 1=A, 0=ABC) s = scroll (1=on, 0=off) r = password for reset in use (1=on, 0=off) p = password for configuration in use (1=on, 0=off) w = pwr dir (0-view as load, 1-view as generator) f = flip power factor sign (1=yes, 0=no)	1
753F - 753F	30016 - 30016	Full Scale Current (for load % bargraph)	UINT16	0 to 9999	none	If non-zero and user settings bit g is set, this value replaces CT numerator in the full scale current calculation.	1
7540 - 7547	30017 - 30024	Meter Designation	ASCII	16 char	none		8
7548 - 7548	30025 - 30025	Reserved				dddd = reply delay (* 50 msec) ppp = protocol (1-Modbus RTU, 2-Modbus ASCII, 3-DNP)	1
7549 - 7549	30026 - 30026	COM2 setup	UINT16	bit-mapped	----dddd -ppp-bbb	bbb = baud rate (1-9600, 2-19200, 4-38400, 6-57600)	1
754A - 754A	30027 - 30027	COM2 address	UINT16	1 to 247	none		1
754B - 754B	30028 - 30028	Reserved					1

Modbus Address Hex	Modbus Address Decimal	Description[1]	Format	Range[6]	Units or Resolution	Comments	# Reg
754C - 754C	30029 - 30029	Reserved					1
754D - 754D	30030 - 30030	Reserved					1
754E - 754E	30031 - 30031	Reserved					1
754F - 754F	30032 - 30032	Reserved					1
7550 - 7554	30033 - 30037						5
7555 - 7559	30038 - 30042						5
755A - 755E	30043 - 30047						5
755F - 7563	30048 - 30052						5
7564 - 7568	30053 - 30057						5
7569 - 756D	30058 - 30062						5
756E - 7572	30063 - 30067						5
						Block Size:	68
12-Bit RTU Readings Section							
12-Bit RTU Block						read-only except as noted	
9C40 - 9C40	40001 - 40001	System Sanity Indicator	UINT16	0 or 1	none	0 indicates proper meter operatio	1
9C41 - 9C41	40002 - 40002	Volts A-N	UINT16	2047 to 4095	volts	2047= 0, 4095= +150	1
9C42 - 9C42	40003 - 40003	Volts B-N	UINT16	2047 to 4095	volts	volts = 150 * (register - 2047) / 2047	1
9C43 - 9C43	40004 - 40004	Volts C-N	UINT16	2047 to 4095	volts		1
9C44 - 9C44	40005 - 40005	Amps A	UINT16	0 to 4095	amps	0= -10, 2047= 0, 4095= +10	1
9C45 - 9C45	40006 - 40006	Amps B	UINT16	0 to 4095	amps	amps = 10 * (register - 2047) / 2047	1
9C46 - 9C46	40007 - 40007	Amps C	UINT16	0 to 4095	amps		1
9C47 - 9C47	40008 - 40008	Watts, 3-Ph total	UINT16	0 to 4095	watts	0= -3000, 2047= 0, 4095= +3000	1
9C48 - 9C48	40009 - 40009	VARs, 3-Ph total	UINT16	0 to 4095	VARs	watts, VARs, VAs =	1
9C49 - 9C49	40010 - 40010	VAs, 3-Ph total	UINT16	2047 to 4095	VAs	3000 * (register - 2047) / 2047	1
9C4A - 9C4A	40011 - 40011	Power Factor, 3-Ph total	UINT16	1047 to 3047	none	1047= -1, 2047= 0, 3047= +1 pf = (register - 2047) / 1000	1
9C4B - 9C4B	40012 - 40012	Frequency	UINT16	0 to 2730	Hz	0= 45 or less, 2047= 60, 2730= 65 or more freq = 45 + ((register / 4095) * 30)	1
9C4C - 9C4C	40013 - 40013	Volts A-B	UINT16	2047 to 4095	volts	2047= 0, 4095= +300	1
9C4D - 9C4D	40014 - 40014	Volts B-C	UINT16	2047 to 4095	volts	volts = 300 * (register - 2047) / 2047	1
9C4E - 9C4E	40015 - 40015	Volts C-A	UINT16	2047 to 4095	volts		1
9C4F - 9C4F	40016 - 40016	CT numerator	UINT16	1 to 9999	none		1

Modbus Address							
Hex	Decimal	Description[1]	Format	Range[6]	Units or Resolution	Comments	# Reg
9C50 - 9C50	40017 - 40017	CT multiplier	UINT16	1, 10, 100	none	CT = numerator * multiplier / denominator	1
9C51 - 9C51	40018 - 40018	CT denominator	UINT16	1 or 5	none		1
9C52 - 9C52	40019 - 40019	PT numerator	UINT16	1 to 9999	none		1
9C53 - 9C53	40020 - 40020	PT multiplier	UINT16	1, 10, 100	none	PT = numerator * multiplier / denominator	1
9C54 - 9C54	40021 - 40021	PT denominator	UINT16	1 to 9999	none		1
9C55 - 9C56	40022 - 40023	W-hours, Positive	UINT32	0 to 99999999	Wh per energy format	* 5 to 8 digits	2
9C57 - 9C58	40024 - 40025	W-hours, Negative	UINT32	0 to 99999999	Wh per energy format	* decimal point implied, per energy format	2
9C59 - 9C5A	40026 - 40027	VAR-hours, Positive	UINT32	0 to 99999999	VARh per energy format	* resolution of digit before decimal point =	2
9C5B - 9C5C	40028 - 40029	VAR-hours, Negative	UINT32	0 to 99999999	VARh per energy format	units, kilo, or mega, per energy format	2
9C5D - 9C5E	40030 - 40031	VA-hours	UINT32	0 to 99999999	VAh per energy format	* see note 10	2
9C5F - 9C5F	40032 - 40032	Neutral Current	UINT16	0 to 4095	amps	see Amps A/B/C above	1
9C60 - 9CA2	40033 - 40099	Reserved	N/A	N/A	none		67
9CA3 - 9CA3	40100 - 40100	Reset Energy Accumulators	UINT16	password[5]		write-only register; always reads as 0	1
						Block Size:	100

End of Map

Data Formats

ASCII	ASCII characters packed 2 per register in high, low order and without any termination characters.
SINT16 / UINT16	16-bit signed / unsigned integer.
SINT32 / UINT32	32-bit signed / unsigned integer spanning 2 registers. The lower-addressed register is the high order half.
FLOAT	32-bit IEEE floating point number spanning 2 registers. The lower-addressed register is the high order half (i.e., contains the exponent).

Notes

1 All registers not explicitly listed in the table read as 0. Writes to these registers will be accepted but won't actually change the register (since it doesn't exist).
2 Meter Data Section items read as 0 until first readings are available or if the meter is not in operating mode. Writes to these registers will be accepted but won't actually change the register.
3 Register valid only in programmable settings update mode. In other modes these registers read as 0 and return an illegal data address exception if a write is attempted.
4 Meter command registers always read as 0. They may be written only when the meter is in a suitable mode. The registers return an illegal data address exception if a write is attempted in an incorrect mode.
5 If the password is incorrect, a valid response is returned but the command is not executed. Use 5555 for the password if passwords are disabled in the programmable settings.
6 M denotes a 1,000,000 multiplier.
7 Not used.
8 Writing this register causes data to be saved permanently in EEPROM. If there is an error while saving, a slave device failure exception is returned and programmable settings mode automatically terminates via reset.
9 Reset commands make no sense if the meter state is LIMP. An illegal function exception will be returned.
10 Energy registers should be reset after a format change.

Modbus Address Hex	Modbus Address Decimal	Description[1]	Format	Range[6]	Units or Resolution	Comments	# Reg

11 Not used.

12 Not used.

13 Not used.

14 All 3 voltage angles are measured for Wye and Delta hookups. For 2.5 Element, Vac is measured and Vab & Vbc are calculated. If a voltage phase is missing, the two voltage angles in which it participates are set to zero. A and C phase current angles are measured for all hookups. B phase current angle is measured for Wye and is zero for other hookups. If a voltage phase is missing, its current angle is zero.

15 If any register in the programmable settings section is set to a value other than the acceptable value then the meter will stay in LIMP mode. Please read the comments section or the range for each register in programmable settings section for acceptable values.